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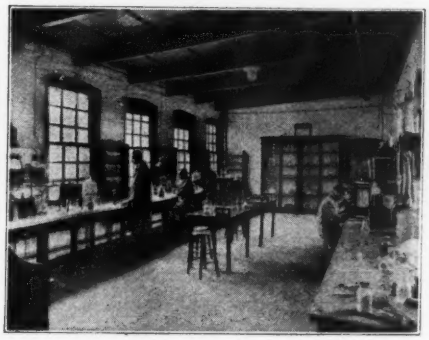

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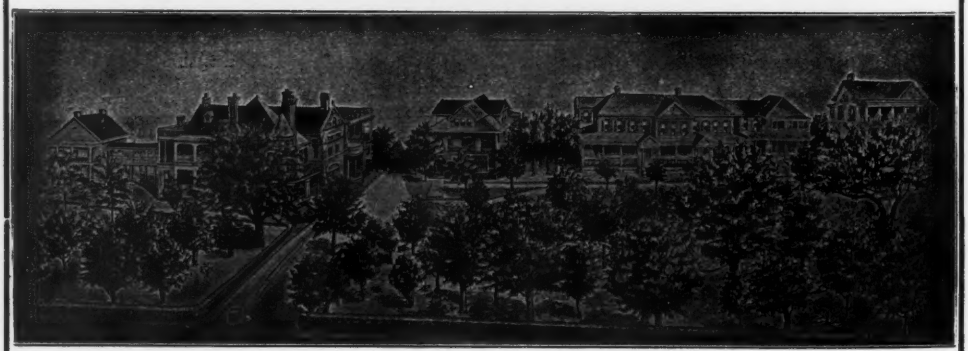

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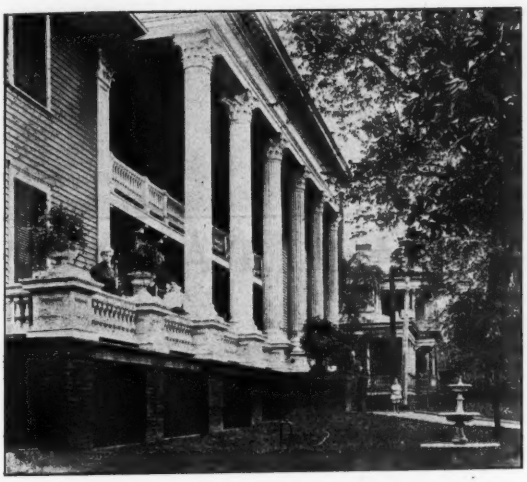

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For the Care and Treatment of

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Building Absolutely Fireproof

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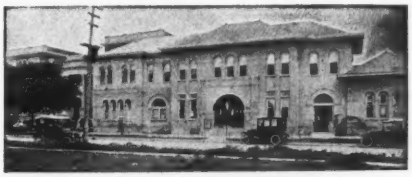

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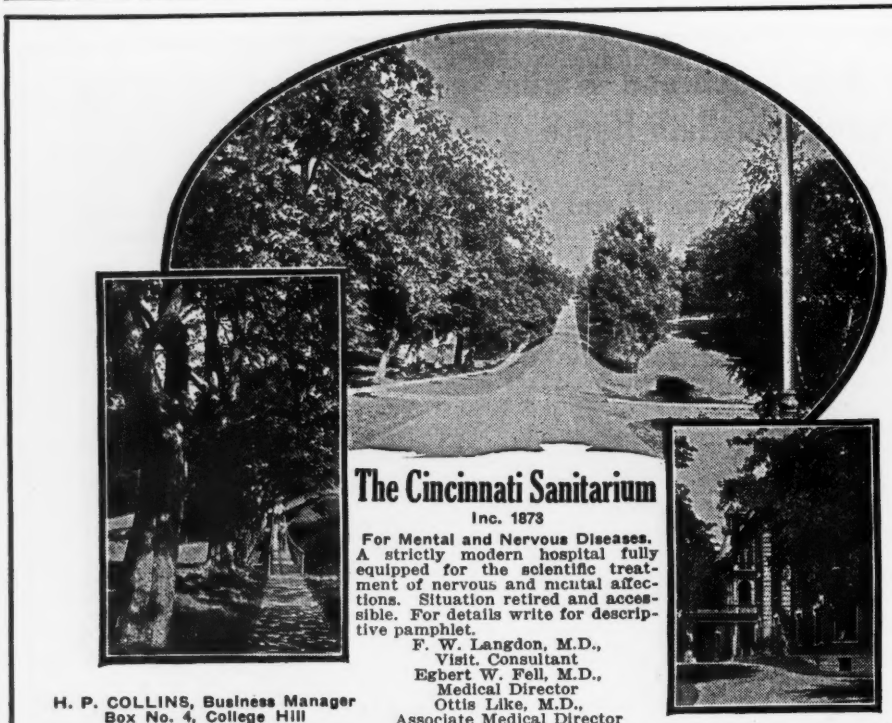

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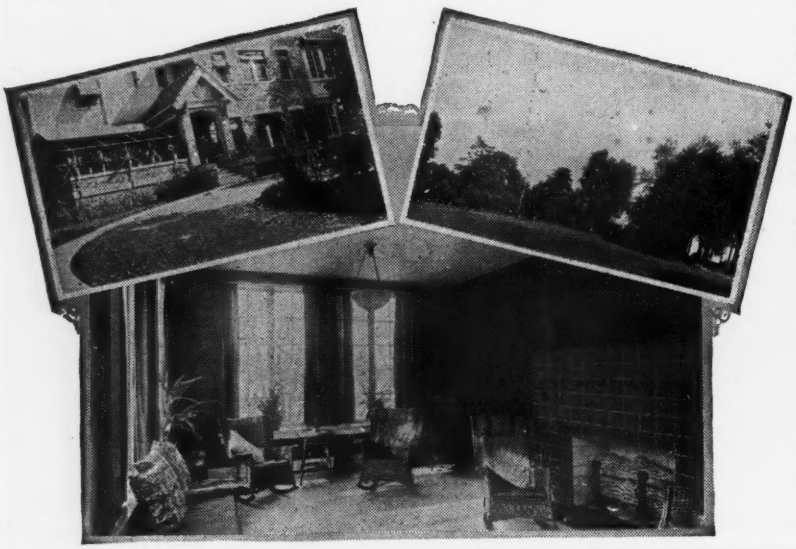

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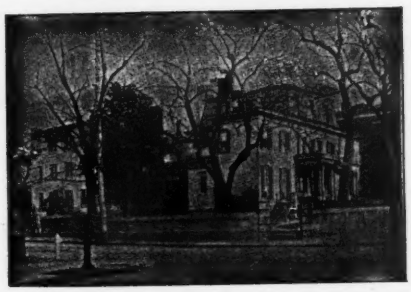

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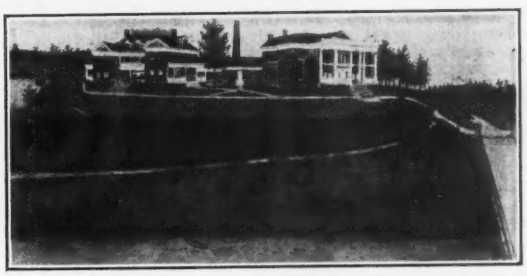

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A complete staff of skilled specialists in co-operation.

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A refined Christian home for the care and protection of unfortunate girls during pregnancy and confinement.

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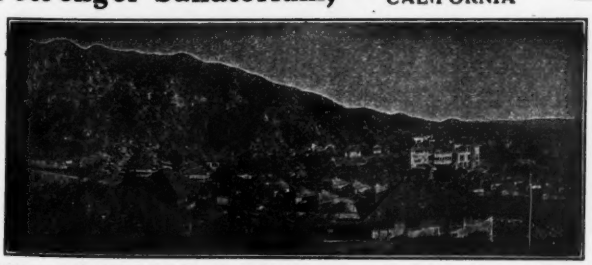

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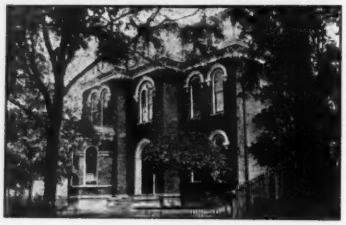

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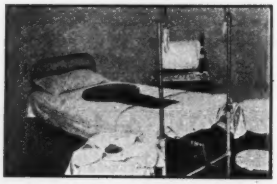

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Volume XVI MARCH 1923 Number 3

MEDICINE

INTERNAL DISEASES, PEDIATRICS, NEUROLOGY, DIAGNOSTIC METHODS, ETC.

CLINICAL STUDIES*

BY M. L. GRAVES, M.D.,
Galveston, Tex.

Clinical is derived from the Greek word Kleinikos, which means a bed and signifies in medical usage the consideration of those persons confined to bed by illness. Hence clinical studies would constitute the painstaking examination of the sick at the bedside. The ambulant sick must also be included.

If Hippocrates be rightly considered the father of medicine, he must also be esteemed a great clinician, for he was the leading figure in the medical school at Cos, and his reputation for the study and healing of the sick, taken to him from many places, spread over the European continent and still dominates medical history. It is gratifying to remember that the fathers of medicine in all its branches were men particularly devoted to bedside study. We are told in Garrison's "History of Medicine" that Rhazes made a thorough study of measles and smallpox and produced in the Arabic language the first authentic account in literature of these two infections. From the same source we learn, in early Mohammedan medicine, that diagnosis was founded on:

(1) The patient's actions; (2) his excreta; (3) the nature of pain; (4) its site; (5) swelling; (6) the effluvia of the body; and (7) this was supplemented by manual examination (Garrison).

Certainly these ancient practitioners set a notable example of careful investigation of the sick, not to be despised by modern students, who too often deliver clinical investigation to the shorter methods of the laboratory and look to its revelations for diagnosis with little labor. If one discards the early dogmas of spirit infestation and reviews the progress of clinical study in a single disease, such as hysteria, still unsolved, it will be seen that tremendous progress has been made from the early Greek conception of this disease as a theoretical travelogue of the uterus to various portions of the human body in search of sexual satisfaction, producing in these unnatural locations bizaare and unusual symptoms. It was a far cry from this Grecian concept of the typical neurosis to the more considerate and scientific view of Lepois, followed by Sydenham, which recognized that these peculiar nervous manifestations had a basis in bodily disorder and necessitated careful examination.

The last great step in a comprehending psychology of this malady was taken by Babinsky[3] when he declared that hysteria is a pathological state induced by suggestion and curable by persuasion and actually demonstrated both of these facts in many such cases at the bedside.

When the French physician, Louis, had prepared himself by extensive dissection of the human body, he became a great clin-

*Chairman's Address, Section on Medicine, Southern Medical Association, Sixteenth Annual Meeting, Chattanooga, Tenn., Nov. 13-16, 1922.

ical leader in pointing out the relation of the structural pathology in the lungs to the physical manifestations in pulmonary tuberculosis. Later he also differentiated

Fig. 1.—Note adiposity of pelvic girdle and mammae. Also poorly developed genitals.

typhus from typhoid fever, making a permanent separation of these two infections and giving to the former its present-day

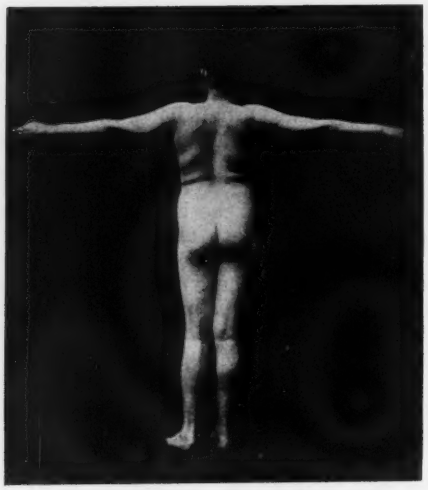

Fig. 2.—Note adiposity of pelvic girdle and scapular regions. Folds of skin.

appellation. Many such illustrations may be given throughout the history of medicine, and it is surprising that amidst the remarkable advances made in the detection of morbid processes in the human body and their somatic expression, so large a

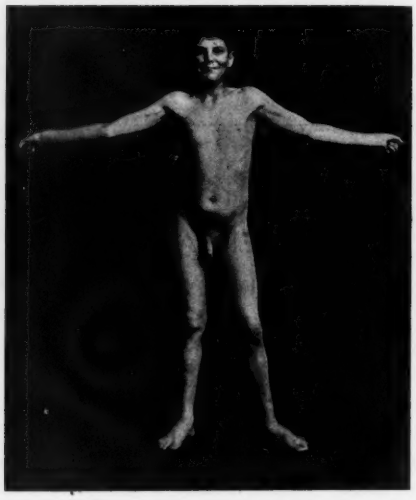

Fig. 3.—Excess adiposity gone. Genital development marked.

number of physicians have ceased to regard careful physical examination and prolonged clinical study of the patient as essential to correct diagnosis and rational

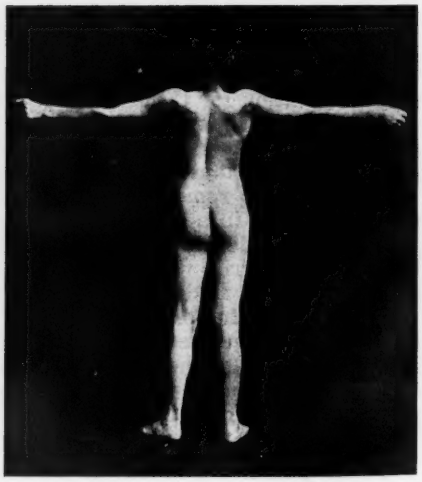

Fig. 4.—Adiposity in pelvic and scapular regions gone.

therapy. They rush to quick and easy laboratory demonstration to avoid the time and painstaking care necessary for the

proper study of the sick. It is noteworthy that the study of the pulse, the action of the heart, the movements of the lungs, tremors and other motor disorders and the

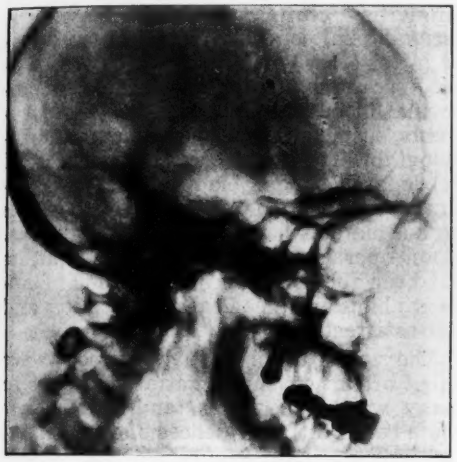

Fig. 5.—Normal sella turcica.

innumerable sensory disturbances of the neurological patient, to say nothing of the interpretation of station, motion, gait, attitude, facial expression and the early pe-

Fig. 6.—Ventriculogram anterior-posterior right and left lateral ventricles.

culiar conduct of the mentally diseased may be illuminating and satisfying. The time-consuming character of such examinations causes insufficient study, erroneous interpretation and therapeutic tragedy and nihilism.

It is not to be wondered that so great a clinician as Sir James McKenzie should

No. 7.—Ventriculogram right lateral ventricle 70 c. c. of air. Note clear and normal outline.

denounce our dependence upon the stethoscope and similar instruments of precision, contending that they should be discarded as soon as invented and chief reliance be

Fig. 8.—Left lateral ventricle. Note sharp interruption in contour posterior horn.

placed upon consideration of the patient's departure from normal feeling and conduct. It is true that the recent group organizations in medical practice have done much, by thorough anamnesis and phys-

ical and laboratory examinations, to make bedside revelations more accurate and useful to the patient. But some of the weaknesses of this improved service are now becoming apparent in the total absence often of the experienced clinician with years of patient and comprehensive study as the background of competency, to act as the integrator of the various opinions rendered by different specialists and to become the arbiter of conflicting views and the final adviser to the patient concerning the various ills usually reported and their relative importance, and to the establishment of a regime, surgical, medical and otherwise, for the restoration of health.

We all see patients even from important clinics with numerous colored slips of paper, which tell in professional hieroglyphics the results of special examinations. At the end of a dizzy round of a week or two, the patient is utterly unable to give any coherent account of what was considered to be the matter with him or what he had to do "to be saved." It is especially important, as was insisted upon by Sir James McKenzie, that thorough familiarity with the earliest symptoms of disease and due consideration of the personal experiences of the sufferer over years of progress in the insidious and chronic diseases particularly, closely and carefully observed, are necessary both to understand and to evaluate symptoms. No hurried survey at any one period of a patient's life can reveal the whole morbid story, even to the most thorough and conscientious of examiners. Hence, many of these patients after expensive and disillusioning visits to such clinics or to consulting practitioners, return to drag out their lives of invalidism, frequently losing confidence in the profession and turning to the swarming schools of irregulars, so rich in promise and so poor in performance.

Further, the enthusiasm today lavished on finding what is the matter with the patient and attaching various names to superficial and other pathological lesions, has become well nigh a craze and the paucity of remedial measures, where surgery is not applicable, is humiliating and disheartening. It is not rare to find a patient slowly progressing to a fatal termination from an insidious and remitting pellagra without classical symptoms, or from some other equally elusive disease, flourish a diagnostic chart exhibiting his gingivitis, chronic tonsillitis, rhinitis, astigmatism, conjunctivitis, gastric hypo- or hyper-chlorhydria, enteroptosis, vascular hypo- or hyper-tension, normal or abnormal blood chemistry, pelvic displacements, suspicious thoracic shadows and indisputable roentgenographic evidences of duodenal ulcer, gall bladder disease, intestinal, peritoneal and omental adhesions, as an adequate explanation of his symptoms. Upon operation the doctor finds that he has been following an *ignus fatuus* of ancient philosophy, medical superficiality and self-satisfaction.

The writer rejoices in the present-day spirit of earnest investigation manifest in many ways and places, and trusts that these rather fitful evidences of widespread carelessness and superficial and insufficient clinical observation and desire for results without labor will begin to decrease. With a fuller comprehension of our duty and with a greater devotion to our responsibility, we may address ourselves anew to clinical observation for the correct interpretation of the signs and symptoms of disease now obscure or unrecognized by our present methods of study.

In urging the great importance of clinical studies, the writer desires to record and report the following histories of two cases presenting interesting phenomena. The one exhibited in childhood the infrequent syndrome of Frohlich, slowly unfolding, with attacks identical with and indistinguishable from, idiopathic epilepsy, with apparent results of treatment both successful and unsuccessful. The other displayed progressive and compelling evidence of the nature of the lesion, with inconclusive evidence from the laboratories. The surgical attack was disappointing yet revealing. The final illumination of the post mortem completed the observation of a hopeless condition.

Case I.—In November, 1918, R. L., a white boy of eleven, came under observation complaining of epileptic attacks. His family history was exceptionally good. The father, mother, three sisters and three brothers were living and well, with no

evidence of degenerative diseases except family adiposity.

P. I.—He had convulsions from birth to three days of age; measles at 9; pertussis at 10; and was in normal health until January, 1918, when a nocturnal convulsion occurred, said to have lasted three hours. In July, 1918, another occurred, and in two weeks there was a third severe attack. All of these attacks occurred at night and were evidently tonic and clonic convulsions. The tongue was bitten each time and involuntary urination and invariable vomiting occurred.

P. E.—The patient was somewhat stouter than normal. This was at first considered a family characteristic, as the father had weighed 266 pounds, the mother 180 and the other members of the family were all above normal weight. The patient's weight was 95 pounds; his blood pressure, 90/56. He had chronic hypertrophied tonsils, a high arched, rather Gothic type of hard palate; nothing particularly wrong in the cardiovascular, respiratory, gastro-intestinal or nervous systems. The pupillary reflexes were normal and the patellar lively, but not pathological. The penis and testicles were smaller than normal for a child of his years and the adipose tissue showed something of the girdle with rather prominent mammary development; but these abnormalities were then too small for anything but slight suspicion of endocrine disturbance. The blood count was:

Hemoglobin	101%
Red cells	5,100,000
White cells	12,100
Polymorphonuclears	69.5%
Transitional	4.5%
Large mononuclears	3.5%
Lymphocytes	19%
Eosinophiles	3.5%

The Wassermann was negative; the urine negative; the stool negative for parasites or ova to cause even the small eosinophilia.

He was not seen for six months, when he again reported with history of three or four attacks of what his physician considered typical epilepsy. There was no substantial change in appearance or condition except that the blood pressure was 108/70, the weight 107½ pounds and the disposition of the fatty tissue about the same. Luminal was prescribed in tablets of 1½ grains. Certain restrictions were placed on the diet, particularly in reference to the proteins and to over-indulgence in sweets, with regulation of the alimentary excretion.

In November, 1920, no permanent improvement had occurred and several more attacks had occurred both in the day and night. An x-ray examination of the head was ordered and the sella turcica reported normal both in shape and size. The roentgenologist, Dr. A. S. Holley, also advised that there was evidence of increased intracranial pressure, especially localized in the left temple area. No sensory or motor phenomena, either general or local, confirmed this suggestion. Mammary and girdle obesity were somewhat increased, but still no convulsions had occurred and his conduct had been normal. The testicles and penis were not developed and stronger suspicion of Frohlich syndrome was aroused. It was noted on his chart that he looked like a mild Frohlich.

On December 30, 1920, a photograph was made and he was put on ½ grain of thyroid and 2 grains of whole pituitary gland. The suspicion of bilobar hypopituitarism and perhaps coincident deficient thyroid activity were present and were considered responsible for his apparent dystrophy.

In January, 1921, the whole gland was discontinued for a while and the anterior pituitary substance administered. He reported for further observation on March 31, 1921, when the following notation was made: "Mammae still large, no change. Abdomen protuberant. Larger fatty deposit about the girdle in the hypogastric area and about the mons. Penis and testicles somewhat larger, but still much smaller than normal. The thymus gland particularly enlarged from the first to the third rib, and to the left and behind the sternum. The general obesity appeared increased."

The patient was bright and normal in appearance and conduct and had had no further convulsions. During the year 1921 variations were made in this treatment without very definite knowledge of the values of the treatment, but the convulsions had been controlled. Later the thymus gland was added to his therapy from the suggestion in the literature that it had some influence in the development of the reproductive organs. This and pituitary substance were continued intermittently with luminal tablets until November, 1921, when he weighed 130 pounds, and all medication was ordered discontinued except the whole pituitary in 2 grain doses three times a day. By some mistake his family continued one tablet of 1½ grains of luminal daily.

In March, 1922, the patient was again seen. The testicles were still small. The penis measured 5.5 cm. in length and the adiposity was unchanged. The diagnosis of dystrophia adiposis genitalia was considered established and confirmed, but in the absence of more definite knowledge of endocrine therapy the treatment was continued. New tablets of the whole pituitary were secured.

On August 8, 1922, the patient came again. His weight was decreased to 92 pounds. He had lost 38 pounds during the preceding six months. The adipose tissue was everywhere reduced. The patient appeared more normal in stature and configuration. The penis measured 9 cm. long. The testicles were much increased in size, the left approaching normal. A few hairs appeared on the pubis. The mind was alert, the appetite good, digestion active, and no convulsions had occurred since December. The patient had done well in school.

On October 8, 1922, further examination elicited the following notation: "Penis 10.5 cm. long; 9 cm. circumference. Left testicle 5 cm. long. Right testicle 3 cm. long. Pubic hairs more numerous, some about 1 inch in length. No axillary hair."

The adipose abnormalities had entirely disappeared. The weight was 95 pounds; the height

1 m., 56.5 cm.; span 1 m., 58.5 cm.; and lower extremities 81 cm. Photograph will show comparative changes since the previous picture.

After this gratifying improvement in general health, both mental and physical, and the rather rapid disappearance during a period of seven or eight months of all unusual adipose deposits and the good condition of the patient, all medication was discontinued. Three or four days afterward there was a return of convulsions, about six of the status type occurring in rapid succession. He was again placed on pituitary and luminal, and no further disturbance has occurred.

This chequered history is here reported, as it appears we were dealing with one or more of three distinct disease entities: idiopathic epilepsy, dystrophia adiposis genitalia, or hypopituitarism with epileptiform attacks and abnormal fat deposits genital hypoplasia known as Froehlich's syndrome.

It was hoped that the marked improvement manifested indicated that his pituitary dysfunction was responsible for both conditions and that relief would be secured pari passu; but this hope was delusive. Cushing and others have reported epileptiform attacks in hypopituitarism. The stumbling therapy of this case is detailed not because of its scientific character, nor from any certainty that the final improvement in the dystrophia was due to it, as it may have been nature's own correctional development. The writer believes that the prompt changes following the last administration of pituitary indicated an efficient therapeutic agent.

This case illustrates a confusing syndrome. The delayed recognition of the Frohlich complex was not considered excusable, although in a developing child with an unusually large family adiposity and concentration of our attention upon the convulsive diseases, frank and early recognition of a developing and different disease is not easy except to those having a larger experience in endocrine disorders. Perhaps the record of this case may stimulate earlier recognition, more comprehensive and complete clinical analysis and more rapid and successful therapy in the practice of others.

Case II.—W. O. R., a stock farmer, was an ex-service man, white and 27 years old. His chief complaint was nervous trouble. His father, mother and two sisters and three brothers were living and well. One sister died at childbirth.

Personal History.—He had had the usual diseases of childhood, but no injuries. Slept well, had a good appetite, and took no alcoholic drink. He smoked cigarettes to excess.

Present Illness.—Seven and one-half months previously he noticed numbness and tingling in the right hand, extending all over the right arm and then to the right leg, and finally to the right side of the face in rather rapid succession. This was followed by a feeling of weakness in the right arm and leg. The numbness and weakness continued to grow worse until he became clumsy in his actions and could not hold or pick up things with his right hand and could not tell what they were when examined with his right hand.

About three months later double vision appeared, which continued. The eyesight was good when he closed one eye and he was able to read fine print as well as ever. Recently eyesight became impaired. When arising after sleeping, dizziness occurred and he experienced a tendency to fall to the right side more than to the left. After being up for a few minutes, all dizziness disappeared.

Some headache had been present from time to time, but was not severe and usually occurred after sleeping. It was always on the left side in the left fronto-tempero-parietal region and might be in the left occiput. It lasted for several hours at a time and then disappeared to recur. The hearing had been good. The bowels were constipated. He denied venereal history.

Physical Examination.—His appearance was healthy. His usual weight was 158 pounds, and his temperature was normal.

Gastro-intestinal Tract.—His tongue was coated and yellowish white. He had fine tremors. His gums, teeth and tonsils were negative. His liver and spleen were normal to percussion and palpation. There was no tenderness or muscular hypertension or distention of the abdomen.

Cardio-Vascular System.—The systolic blood pressure was 122 and the diastolic 78. The pulse rate was 80, with regular rhythm. The heart and arteries were negative.

The respiratory system was negative. There were no rales, dyspnea or other symptoms.

Genito-Urinary System.—He had a varicocele on the left side. The left testicle was lower than the right. There was no lesion of the genitalia.

Nervous System.—His mentality was good.

Sensory.—Astereognosis was complete in the right hand. The patient was unable to distinguish objects at all. He was able to distinguish gross difference in weight. On the left side there was perfect recognition. The entire right side of the body, face, trunk, arm and leg, showed diminution of all forms of sensation.

Touch.—Light touch with cotton was especially diminished over the right hand and right face.

Pain.—Sensation was diminished, but not so much as touch. His temperature sense was entirely unreliable, particularly over the back of the trunk, the right hand and arm and the right leg. He felt cold as hot.

Motor.—He had a slight paresis of the right side of the face. The right angle of the mouth was lower. Wrinkling the brow, whistling and other muscular movements showed lagging and diminished activity on the right side. He had paresis of the right arm and hand, particularly the distal extremity and to a less extent the right leg.

Eyes.—He had a paresis of the right external rectus, producing slight internal strabismus. Both superior recti muscles were paralyzed so that the eyes could not be elevated. The left was worse.

He had a slight horizontal nystagmus, but variable.

Reflexes.—These were active, and equal on both sides.

Station.—There was a slight static ataxia.

Motion.—The patient walked with a cerebellar gait, feet wide apart, rather short steps, head tilted backward, chin sometimes turned to the right, and increased by turning or suddenly stopping. There was an apparent tendency to fall backward and to the right, though this varied.

Muscular Atrophy.—Coordination of the muscles, such as touching the nose, putting fingers end to end, was apparently undisturbed, except that past pointing was present in the right hand. At times the patient past pointed about 3 or 4 inches to the right. At other times it appeared normal.

Blood Count.—April 21, 1922:

Hemoglobin	99%
Red cells	5,060,000
White cells	7,800
Polymorphonuclears	63%
Transitionals	3%
Large mononuclears	2%
Lymphocytes	31%
Basophiles	0
Eosinophiles	1%

Blood Wassermann.—April 22, 1922, negative. Cholesterin and acetone insoluble antigens.

Urinalysis.—April 21, 1922: Color, yellow; appearance, clear; reaction, acid; specific gravity, 1025; albumin, negative; sugar, negative; epithelium, occasionally; leukocytes, occasionally; mucus, good deal.

Spinal Fluid Examination.—April 22, 1922: Appearance, clear; pressure, normal; globulin, positive +; Fehling reduction, positive; organisms, none; cells, 35 per c. mm.; Lange's, negative; Wassermann, negative.

Report of eye and ear examinations by Dr. S. M. Morris as follows April 25, 1922:

Fundus.—Double choked disc. Two dioptres right eye; 3.5 dioptres left eye.

Vision.—O.D. 20/30—20/20w—0.755 — 0.25 C. Ax 180) without a cycloplegic. O.S. 20/20 — —20/20w— 0.24 C. Ax 180)

Fields and Form.—No contraction.

Ocular Muscles.—Paresis of both superior recti, more marked on right side. Possibly slight paresis of right external rectus. Right internal strabismus. Diplopia in all directions except extreme abduction to the left. Horizontal nystagmus of the irritative type in all positions of the eyes.

Vestibular Reactions.—When ears are douched with cold water, reactions are normal in every respect except that they are slightly delayed on the right side.

Hearing.—Somewhat impaired on right side, probably due to chronic catarrhal otitis media.

Roentgenological examination by Dr. Lechinger was as follows:

"This case shows well marked mottling of the bones of the skull. In the upper portion of the frontal and parietal bones there is a well marked rarefactive osteitis. There is also a fairly marked separation of the lamboid suture on the right side extending upward and inward and curving to some extent to the antrum area. There is a suggestive shadow which does not appear, however, on the lateral view. I am not certain as to the exact nature of this shadow. In the occipital fossa there is an area of much decreased density."

SUMMARY

Symptoms.—Paresthesia right side. Paresis right side. Astereognosis right side. Sensory diminution and perversion right side. Ocular paralysis superior recti and right external rectus. Static and cerebellar motor ataxia. Variable horizontal nystagmus. Diplopia persistent. Vertigo. Nausea. Vomiting. Headache. Choked disc both eyes.

Diagnosis.—Tumor of the brain, location and character undetermined.

On May 2, 1922, the patient entered the Sealy Hospital.

Second spinal fluid examination was as follows May 2, 1922: appearance, clear and colorless; pressure, moderately increased; globulin, normal; Fehling reduction, normal; organisms, none; cells, 1 per c. mm.; Lange's, normal; Wassermann, negative.

Urinalysis, May 24, 1922.—Color, cloudy, pale yellow; reaction, alkaline; specific gravity, 1010; sediment, flocculent; albumin, negative; sugar, negative; leukocytes, few; epithelial cells, fair number, squamous and cuboidal.

Vestibular examination by Dr. Wall as follows May 6, 1922:

Nystagmus.—Looking to right, slight; looking to left, slight; looking up, slight; looking down, slight. To right: Amp. good. Duration, 50 sec. To left: Amp. good. Duration, 15 sec.

Summary.—Romberg, slight; turning head to left, falls backward.

Final examinations June 2, 3, 1922.

The patient remained in the Hospital. Spinal punctures and drainage were continued and on May 20 he had a pneumo-ventriculograph by spinal puncture. Seventy-two c. c. of spinal fluid were withdrawn and 72 c. c. of air injected. This was performed by withdrawing and injecting 4 c. c. at a time with the patient in a sitting position.

A copy of the ventriculogram is attached.

The report of Dr. Lechinger is attached.

On May 31 the patient complained that the left side of the face felt numb and thick and swollen and that food appeared to collect in the left cheek.

June 3, 1922, the sense of stiffness of the lip has extended to the right side. He felt unable to get food from between the lower lip and teeth with the tongue and used fingers to remove it. His headaches were more severe and frontoparietal on the left side. There was tenderness on pressure in fronto-tempero-parietal area 4.5 cm. above the ear and covering a space of 4x5 cms.

Taste.—Normal to galvanic current on both sides of the tongue. Salt and bitter were imperfectly recognized on both sides with no apparent inequality.

Sense of Smell.—No anosmia. He smelled equally well on both sides tincture valerian, milk of asafoetida, and aromatic spirits of amonia.

Sense of Position.—On right side it was not accurate. His perception was unreliable, but not markedly abnormal.

Superficial Reflexes.—The epigastric and abdominal were diminished on the right side. The cremasteric was apparently equal on both sides.

Plantar reflexes showed slight tendency to extensor response on the right.

Paresthesia and sensory disturbances to touch. Pain and temperature were still further diminished on the right side. Temperature was very imperfectly recognized over the right trunk, hand and leg. Cold was recognized as heat, though not in all localities. Persistence of sensation was experienced in the right side after the neck had been pricked with a pin.

Motion.—Paresis of the right side of the body was more pronounced, particularly over the right angle of the mouth and the right frontalis.

Paresis and paralysis of ocular muscles remained the same.

The ataxia was more pronounced.

Astereognosis of the right hand was absolute. The patient was unable to distinguish the quality and texture of different articles. Vision was diminished and diplopia present.

Diagnosis.—Subcortical tumor of the brain.

Location.—Posterior to the fissure of Rolando and above the fissure of Sylvius, involving the tracts of the post central, parietal and angular lobules on the left side and extending downward so as to produce pressure on the ventricles and internal hydrocephalus.

Against this location the ventriculogram shows the posterior limb of the right lateral ventricle cut off, and I can offer no adequate explanation of this.

Character of Tumor.—The age, rapidity of growth and character of symptoms led me to believe that the tumor was a glioma or sarcoma.

Surgical exploration was advised, but the patient and friends were informed that the tumor might be situated in the base, be irremovable, and only some temporary relief from pressure be obtained. The sufferer insisted upon operation and accordingly Dr. J. E. Thompson did a decompression of the left side on June 7, 1922. Nothing found. The following is the surgical report.

DECOMPRESSION OPERATION, JUNE 7, 1922

The osteoplastic flap over the left parietal region was thrown up. Condition immediately following operation was good. The patient was found to be in a comatose condition twenty hours after operation. His respiration was slow and stertorous and his pulse full and strong. There was considerable edema of the left side of the face and right hemiplegia. The patient was quiet. A puncture of the left ventricle was made and about 4 ounces of fluid were drained off. The patient became restless. Involuntary movement of the left side occurred freely, but there was no movement of the right side. The head turned to the right. The condition of the patient remained about the same for the next two days except for gradual slowing of respiration. Coma continued. His pulse was good.

At 10 p. m., June 9, puncture of the ventricle was made. Following this some twitching of the face was noted. Forty-five minutes later convulsive movements occurred and continued during the night. He died of respiratory failure.

Post Mortem Record.—June 10, 1922, 12 noon. By V. H. Keilier.

The brain only was removed, immediately after embalming. The operative wound was opened, remainder of the skin cut and the skull cap removed in the usual manner. In removing the operative skin flap, a considerable amount of blood clot was disturbed, and at the anterior and posterior margins of the trephine opening where the Gigli saw had penetrated dura there was some herniation of mushy brain substance. The dural sutures were in place and there was no laceration of the brain under them. On removing the skull cap the dural sinuses were seen to be stuffed with blood, as were all veins, but this was thought to be the result of the recent embalming. No coagulum was present in any of the sinuses.

On removing the brain the vessels of the pia were found somewhat more congested than normal, but this also was probably due to the embalming. The entire surface of the brain was normal except for this congestion and for the following:

(1) Herniation and laceration as the result of operative procedure, as previously noted.

(2) Dilatation of the third ventricle.

(3) Possibly an undue herniation of the cerebellum into the foramen magnum, but this was no greater than is frequently found in non-pathologic brains.

Very careful palpation of the whole brain revealed no difference in texture suggesting tumor. All cranial nerves were normal. Careful inspection showed no alteration in contour indicating tumor. It should be mentioned that in removing the brain the lacerated areas at the operative site might have allowed the escape of fluid as the skull cap was removed. The injection of formalin was so recent that the configuration would not have been preserved had this occurred. At any rate, there was no evidence of greatly increased intracerebral tension except in the dilatation of the third ventricle already noted.

Section was made horizontally through the level of the corpus callosum. Except for the dilatation of the ventricles (which was more marked than after further fixation in formalin later on) nothing abnormal was noted.

Another section was cut just below the level of the highest part of the cerebellum, the brain being carefully supported so as to make this section as accurately as possible. The left thalamus presented a non-encapsulated hemorrhagic tumor

about the size of an English walnut or a little larger, which extended beyond the median line.

The brain was not examined further at this time in order that it might be properly hardened and cut with greater precision. The gross description was made by Dr. William Keiller and here follows:

Description of section of the brain by Dr. William Keiller:

A section was cut June 16, 1922, after thorough hardening.

(1) A horizontal section was cut through the lower level of the body of the corpus callosum, opening an upper view of both ventricles. The left ventricle was decidedly dilated. Corpus callosum showed hemorrhages on the left side. The right side was normal, and was cut at a slightly lower level than the left. On the other side the section was just above the caudate nucleus. The left ventricle was slightly dilated. The left half of the corpus callosum showed small hemorrhages. The left choroid plexus was apparently normal. The upper surface of the thalamus showed some small hemorrhages. Centrum ovale behind the trigonum ventriculi was disorganized as a result of the operative trauma.

(2) This section cuts the thalamus about 1 cm. beneath its highest point. Both caudate nuclei were apparently normal. The right side was normal except for considerable dilatation of the right ventricle. The left lateral ventricle was somewhat invaded by the tumor. The left caudate nucleus, lentiform nucleus and internal capsule were normal. The left thalamus showed some dark discoloration which suggested that the level of the tumor was just reached. The upper part of the thalamus, that included the corticothalamic fibres, appeared to have escaped and the tumor at this level mainly occupied the medial thalamic nucleus, the anterior escaping. The optic radiation on the left side was interrupted by disorderly brain substance the result of operation.

(3) Section 0.5 cm. deeper than the above. The right half was normal. The posterior horn of the left lateral ventricle was slightly dilated. Except for the disorganization due to operation, the optic radiation was apparently normal. The caudate nucleus, lentiform nucleus and anterior limb and genu of the left internal capsule were normal. There was possible invasion of the posterior limb of the left internal capsule by the tumor. The thalamus, including the pulvinar, seemed to be rather completely involved. The pineal gland was compressed. The lateral geniculate body probably escaped. The upper part of the third ventricle was reduced to a slit by the pressure of the thalamic tumor somewhat beyond the middle line. The median nucleus of the thalamus was most completely involved, and was probably the earliest part affected.

(4) Showed very little owing to the irregularity of the section made at about this level at the time autopsy was performed.

(5) Section touched the upper limit of the cerebellum. Here the tumor was much more extensive. There was much blood staining. The mass projected well to the right of the median line and appeared to involve the left corpora quadrigemina, as well as the greater part of the thalamus. This section was at the level of the lower margin of the aqueductus cerebri. The left ventricle at this level showed no evidence of compression, but there was probably dilatation of the middle horn of the right ventricle. Section of the tissue had been taken from this for microscopic examination.

(6) One-half centimeter below Section 5. The middle horn of the right ventricle was probably slightly dilated. The tumor projected well beyond the middle line and was bounded by the much elongated aqueductus cerebri. What was probably the right superior quadrigeminal body and part of the tegmentum was stretched along the right margin of the tumor. The tumor here measured 3 cm. laterally and 4.5 cm. antero-posteriorly. It was irregularly mottled, parts being somewhat intermediate in color between white and gray substance, while the bulk of the mass was deeply blood tinged. These areas were spongy in texture and had the appearance of a very vascular growth and not of interstitial hemorrhage. Surrounding the spongy area was an area which varied from deep brown to black in the formalin-hardened specimen and was evidently hemorrhagic. The tumor here occupied the whole of the basal part of the thalamus and the left quadrigeminal body. The middle horn of the left lateral ventricle was only slightly if at all dilated. The cortex of the superior temporal convolution showed operative trauma.

(7) One-half centimeter below Section 6. The section on the right was at a lower level than on the left. Right crus cerebri was somewhat distorted, as was also the right red nucleus. Otherwise the right side was normal. The tumor mainly occupied the left quadrigeminal body, pushing the right over toward the right side. The aqueductus cerebri was dilated into a semilunar slit with an extremely thin roof. The section on the left cut through the middle of the optic tract and the condition at this level suggested that the left external geniculate body with the ending of the left optic tract was invaded. (The patient should have had right homonymous hemianopsia.) The occipital lobe had entirely escaped. The trigones of both ventricles appeared to be equally dilated and there was moderate dilatation of the third ventricle.

(8) One-half centimeter above the floor of the third ventricle. This section passed through the deepest part of the locus perforatus posterior. The ventricles were all slightly dilated at this level. The right crus cerebri, substantia nigra and red nucleus were distorted from pressure, but probably did not suffer to such an extent as to cause disturbance of function. The tumor here appeared to grow to a considerable extent from the left half of the floor of the fourth ventricle; and at this level would probably involve the motor nucleus of the left fifth nerve. It also invaded the left brachium conjunctivum, pressed on the right and probably invaded both halves of the corpora quadrigemina (posterior part). The left

red nucleus was distorted, but probably escaped. There was possible invasion of the lateral portion of the left basis pedunculi. The pyramidal portion of this apparently escaped.

(9) Section through the pons in the place of the brachium pontis showed that the tumor sprang from the left half of the floor of the fourth ventricle and involved the more superficial parts of the floor. The motor and lateral sensory nuclei of the fifth and at a slightly lower level the motor nucleus of the left seventh and perhaps the dorsal nucleus of the cochlear and Deiter's nucleus were probably involved, but from the gross examination alone it was not possible to state this definitely. The tumor projected dorsally into the fourth ventricle, pressing up the roof and slightly invading the fibres on the medial side of the lower end of the corpus dentatum. The choroid plexus everywhere was free.

(10) Section at the level of the lateral ventricular foramen (Key and Retzius) below the tumor. The lowest level of the tumor was 3 mm. above this level.

Microscopic Examination.—The sections were stained with hematoxylin and eosin. Later, sections are to be made with toluidin blue, differential glia stain, and also some of the basal nuclei stained by iron hematoxylin to show which of these nuclei are involved. The tumor sections obtained showed that the shape of the cells and their size differed greatly in different areas. There were many areas in which the bulk of the cells were spindle-shaped with fairly numerous "tumor giant cells" having one or more nuclei. Other areas showed a mixture of spindle and small round cells which were very loosely arranged. In still other areas there were a few fibrils. Almost all of the cells were round with deeply stained nuclei and considerable cytoplasm. Throughout the whole mass there was a dense network of fine glia fibrils, but no fibrous tissue. Throughout all parts of the section there were many blood vessels. Most of these had thin walls and opened perivascular spaces resembling those found in brain cortex. In other areas the walls of the vessels seemed to be composed of the cells of the tumor itself. This evidently formed a complete vessel wall, for there were no signs of interstitial hemorrhage. The diagnosis was glio-sarcoma.

Attention is directed:

(1) To the motor and sensory symptoms in the right half of the body, particularly delimited and exhibiting as the most prominent of the sensory defect complete right-sided astereognosis.

(2) The special symptoms usually indicative of tumor of the brain.

(3) The confusing character of the ventriculogram, correct interpretation of which awaited post mortem.

(4) The revelation of the surgical attack, confirmed later by post mortem examination, furnishing positive proof of the inaccessibility of certain cerebral tumors, notwithstanding the advanced surgical technic, the helpfulness of ventricular radiographs and the confidence of some operators that there is now no brain tumor which may not be surgically attacked.

(5) The absence of pain and other deficiencies in the so-called thalamus syndrome made positive recognition of the tumor originating in the thalamus doubtful, and subcortical tumor was therefore considered more probable, an error indicated by the surgical operation and confirmed by the post mortem examination.

THE RIDDLE OF UREMIA*

By David Riesman, M.D.,
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The problems of clinical medicine never grow less. It is true of them as some great scientist once said of facts in general, that the sum total of those unknown is greater than the sum total of those known. When the germ causes of diseases were discovered, men in the first flush of their enthusiasm thought that the veil hiding the nature of these diseases had been completely drawn away. But we are now realizing that only a corner has been lifted and that a thorough investigation of those obscure chemical and perhaps mechanical conditions which make it possible for the germ to do its work remains yet to be made. For many years scientific investigators will be kept busy searching out these mysteries, and when they have solved them, new ones will appear. It is well that things are as they are. Thus only is our ambition sustained and our conceit kept within bounds.

With regard to the kidneys and their relation to the body, the same general truths obtain. We are pushing the bounds of knowledge wider, but never to the end. Bowman taught us the structure and guessed with a true scientist's imagination at the functions of the kidney tubules and their expanded portion, the capsule. Rich-

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ard Bright noted the relation of albuminuria and dropsy to certain structural changes in the organ. Ludwig and Haidenhein started an historic quarrel on the nature of the urinary secretion, a quarrel that later generations have continued. Gull and Sutton perceived the important relation between disease of the arteriocapillary circulation and disease of the kidney, while other phases of this problem were studied by George Johnson, Senator, Volhard and Fahr, Widal, Ophuls, and others. Cushny reviewed the Ludwig-Haidenhein controversy and brought his own researches to bear upon the problem, coming to the conclusion that the secretion of urine is primarily a filtration process. Martin Fischer called upon colloid chemistry for light upon the nature of Bright's disease. Straus, Widal and many other investigators have thrown light upon the blood changes produced by disease of the kidney. Lastly, has come the work of Richards to give us a more intimate knowledge of the activity of the glomeruli and of the action of drugs upon the glomerular circulation.

In its totality, this is no mean accomplishment of a hundred years' conscientious labor, and yet, compared with what we do not know of the kidney and of its diseases, how insignificant an achievement!

Of the important condition we call uremia, so little is actually known that it constitutes an opprobrium of clinical medicine. Like the cause of cancer, it is an unsolved riddle. We can add almost nothing today to the definition of uremia formulated many years ago by Bouchard:

"Uremia is caused by a complex poisoning in which share in unequal proportions all the poisons introduced into the system or manufactured by it."*

How can the nature, the origin of this complex poisoning be solved? Perhaps by doing what the astronomers are doing in their study of the stars—parceling out the field among many. When pathologists, biologists, physiologists, meet, might they not take up such a subject as uremia and assign special topics under it to different laboratories, to different men? This is a method applicable to many problems in medical and other sciences.

What is uremia? Uremia is the end-result of nephritis, just as coma is the end-result of diabetes. That does not mean that all cases of nephritis must end in uremia any more than that all cases of diabetes must end in coma. The word nephritis is a generic term and includes conditions widely different in origin, course and consequence. For that reason one would not expect all forms of nephritic disease to have an equal tendency to produce uremia. In some, death takes place from other causes before the system has become thoroughly poisoned. The same thing holds true of diabetes mellitus.

Is uremia due to a single poison or to a plurality of poisons? At first sight the great multiplicity of symptoms may be thought to argue against a unitary cause. The complexity of the renal function may also seem to militate against such a conception. There are, however, reasons that make the belief in a single primal poison tenable. We do not know what this poison is—whether it is a toxalbumin or a non-protein poison. Whatever the nature of the hypothetical uremotoxin, this much we know: that it has an affinity for many organs and tissues. It has a tropism for the liver, the central nervous system, the capillaries, the neuromotor mechanism, the adrenals, etc. By attaching itself to these organs and tissues, it disturbs their function, so that whatever part these organs play in the metabolism of the body is bound to suffer. This explains to some extent the great complexity of the syndrome called uremia.

THE ANATOMIC SURSTRATUM OF UREMIA

If we look for a moment into this question, we find conditions most perplexing, for almost any variety of renal lesion may be productive of uremia. Acute as well as chronic nephritis, chronic parenchymatous as well as chronic interstitial nephritis, may be associated with uremia. Nevertheless, there is one form which, above all others, has a tendency to lead to the uremic state, namely, chronic glomerulonephritis, also called chronic interstitial nephritis.

VARIETIES OF UREMIA

Many classifications of uremia have been proposed. That of Widal is advantageous

*Castaigne: Les Maladies des Reins, Paris, 1921.

in practice as well as a fruitful stimulus to research. Widal classifies the manifestations of uremia into (a) those due to retention of chlorids—uremie hydropigene, or dropsical uremia—and (b) those due to retention of nitrogenous substances—uremie seche, dry uremia. The first is sometimes spoken of by French writers as uremie chloruremique and the second as uremie azotemique. These types, however, are not always clear-cut. Transition forms are common. The so-called chronic interstitial nephritis is, as a rule, not associated with dropsy and leads to dry uremia. However, in a fair proportion of cases dropsy eventually appears, either because of circulatory failure or because of progressive renal damage without the interposition of failure of the circulation.

For practical bedside work a classification of uremia upon a symptomatic basis has advantages. On such a basis we may classify the manifestations as (a) nervous, (b) mental or psychotic, (c) visceral, (d) dermal, and (e) mixed.

Let us now study these manifestations in some detail.

(*a*) *Nervous Manifestations.*—Aphasia, monoplegia, hemiplegia, headache, disturbances of vision and of hearing, neuralgia, convulsions and coma.

It is rather characteristic of the motor disturbances — monoplegia, hemiplegia, aphasia — that they are transitory and functional in nature. Yet while they last, they are indistinguishable from those produced by such organic changes as thrombosis or hemorrhage. I well remember an experience I had as pathologist to the Philadelphia General Hospital. A number of cases had been sent to the autopsy room from the nervous wards with a diagnosis of apoplexy, but no hemorrhage was found, the only lesion that could have been held responsible for the hemiplegia being advanced kidney disease. This fact so impressed the neurologists that for a time they made almost routinely the diagnosis of uremia in acute cases of hemiplegia, only to be proved wrong quite frequently, the autopsy showing with irritating perverseness the presence of hemorrhage.

We have no clear knowledge as to the manner in which these transitory functional brain disturbances are brought about. It is possible that the poison acts directly upon the brain cells. On the other hand, it may act primarily upon the blood vessels, causing spasm and depriving the related parts of the brain of blood.*

Uremic Headache.—In its intensity *uremic headache* is comparable to that caused by brain tumor; and since vomiting occurs in both conditions, it is not surprising that the thought of brain tumor often arises. I know of a case in which all preparations for a trephining operation had been made, when at the last moment the real nature of the headache was discovered. Uremic headache frequently radiates down the back of the neck.

Uremic amaurosis is an interesting symptom. It may follow a convulsive seizure or may occur independently of other symptoms.

Uremic neuralgia—trifacial, dental, supraorbital—needs only to be mentioned.

Uremic convulsions generally occur in groups. As many as six, eight or ten may occur within 24 hours. Taken by themselves, the convulsions cannot be distinguished from those of epilepsy. They are, however, preceded more often than is the case in epilepsy by restlessness and are frequently followed by delirium or mild wandering rather than by sleep.

When the antecedents of *coma* are unknown, the condition becomes one of the most perplexing problems in clinical medicine. The temperature in uremic coma is usually subnormal, but it may be elevated to 100, 102 or 103°. Neither the reflexes nor the pupils are of much help. The presence of albumin and casts in the catheterized specimen of urine, hard arteries, large heart and high blood pressure are suggestive of uremia. The finding of a high urea content in the blood comes as interesting, though often belated information.

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*While the disturbance in brain function is usually attributed to deprivation of blood, meaning thereby of nutritive material, I have been led through the work of Barcroft to the belief that it is the cutting off of the oxygen supply, histanoxia it might be called, that is primarily responsible for the diminution or suspension of function.

Both the convulsions and the paralyses are most common in the dry form of uremia, but occur also in the combined form of glomerulonephritis with dropsy, of which I have spoken.

(*b*) *Mental or Psychotic Manifestations.* These may take the form of melancholia or mania, of mild states of mental depression, and of amnesia. I do not wish to imply that uremic intoxication is always the basis of melancholia or mania. That is not true, but since uremia may produce such psychoses, that fact should always be remembered in the study of acute mental cases.

The maniacal type is illustrated by the case of V. D., an Italian, who came to the Philadelphia General Hospital with signs of chronic glomerulonephritis. Soon after admission he had several convulsions. Although the nitrogen retention was very high, the creatinin, for example, being up to 25 mgm. per 100 c. c. of blood, the convulsions ceased after bleeding, alkaline infusions into the blood and sweating. Soon, however, he passed into a more or less maniacal state, during which he was so abusive, vicious and destructive that he had to be restrained. After several days, during which he could scarcely be approached, he recovered and eventually turned out to be one of the most likeable patients in the ward. I have seen this Jekyl and Hyde alternation in other cases. Seeing but a single phase is sometimes misleading.

One of the most remarkable manifestations of uremia I have ever seen is somnolence or narcolepsy. Some years ago a trained nurse came under my observation who had been sleeping for six days an apparently quite natural sleep, from which, however, she could not be aroused. We thought of drug intoxication, but could find no evidence of it. It was before the days of encephalitis lethargica and before it was customary to make routinely blood and other functional tests. The urine was free from albumin, but contained in every specimen some hyaline and granular casts. Our eventual diagnosis of uremia was arrived at by the process of exclusion, and was confirmed at autopsy, which showed two shriveled kidneys not much larger than a silver dollar in diameter, highly granular and typical of chronic interstitial nephritis.

Among the milder manifestations are great irritability and touchiness appearing in patients who previously were of a reasonable and placid disposition. Such a change may be a precursor of uremic convulsion or a sequel of it.

Retrograde amnesia is not an uncommon symptom after any sort of convulsion, but it is more common after a uremic seizure than after the classical epileptic attack.

The great variability presented by the nervous and mental symptoms of uremia depends in part upon quantitative variations in the poison and in part upon differences in individual nervous and mental reactions.

(*c*) *Visceral Manifestations.*—These are almost endless. I shall point out only the most important. With regard to the cardiovascular manifestations we can hardly call hypertension and hypertrophy of the heart uremic symptoms, although in the last analysis they may be due to the same poison. The condition to which I want to call your attention in particular is acute pericarditis, which is not an infrequent incident during the course of chronic glomerulonephritis. Because of the prominence of other symptoms, it is often overlooked; yet it is of great importance since it may be the immediate cause of death. In the majority of cases I have seen, the fluid was bloody. A correct diagnosis can only be made by a daily routine examination of the heart or by an x-ray study.

The blood pressure in uremia is usually high, from 250 to 270 systolic and 150 to 170 diastolic. Such a finding may be of value in the diagnosis, but there is a rather mysterious group called vascular or essential hypertension, in which the high blood pressure is apparently independent of kidney changes, although the symptoms in many respects resemble those of nephritic hypertension.

Sometimes the blood pressure in uremia is low. The patient with uremia, convulsions, mania and hypercreatinemia, whose case I reported above, had a systolic blood pressure of 120 to 130, except on one occasion, when it was 170. I have also seen hypotension, a systolic pressure of 84 to

86, with uremia that at autopsy was shown to be dependent upon contracted kidney. In two such cases the organ was not larger than a silver dollar.

The relation of hypertension and nephritis is obscure. In some cases, perhaps the majority, the primary factor is arterial disease, functional or structural, which extends to the renal vessels as well as to those elsewhere in the body. In other cases some toxic factor injures the kidney, causing a nephritis which — how we do not know—leads to hypertension.

Whatever the process may be, the result is lessened functional capacity of the kidney, and in consequence greater impermeability to waste products.

The most important of the *blood changes* is the accumulation in the blood of non-coagulable nitrogen. Our knowledge of this important subject we owe to Straus, Widal, Ambard, Folin, McLean and many others. A very large share of the work has been done in this country.

Of the non-protein nitrogen, urea constitutes by far the largest fraction. Usually the creatinin and the uric acid are also increased above the normal. The non-protein nitrogen increase in the blood is not a direct cause of uremia, for it may exist for a long time without any toxic symptom appearing. Should the patient, however, sustain a trauma or shock, and uremic symptoms will promptly appear.

It is in the dry form of uremia that one finds the greatest retention of all the nitrogenous substances. In the dropsical form there may be no great increase of these substances in the blood, but as the dropsical fluid no doubt contains all of the waste products, the total amount actually retained in the system may be enormous. I have several times seen the development of delirium during the rapid subsidence of an extensive dropsy and have thought it was an effect of the reabsorption of long-stored quantities of waste products.

Another change in the physical chemistry of the blood, and one of great importance, is an increase in the hydrogen-ion concentration, which is tantamount to saying that there is a certain degree of acidosis. The acids responsible for uremic acidosis do not belong, as those of diabetes do, to the volatile fatty acid group, but are of the non-volatile type derived from the metabolism of the proteins.

Anemia is an interesting symptom found in a small number of uremic cases. It may be so striking that it dominates the clinical picture and obscures the underlying nephritis. There is at times very close surface resemblance between uremic nephritis, pernicious anemia, and myxedema.

Another interesting change in the blood, or perhaps in the blood vessels, is one to which I called attention a few years ago—hemorrhagic diathesis, which manifests itself in bleeding from the mouth, the kidneys and the gastrointestinal tract.

One of the most important of the *respiratory manifestations* is paroxysmal dyspnea, usually nocturnal. Equally important, if rarer, is pulmonary edema. Cheyne-Stokes breathing is a very frequent, but perhaps not a very important symptom. I should like to dwell upon the great clinical interest of acute pulmonary edema, but shall postpone that until I speak of treatment.

Gastrointestinal Symptoms. — Uremia produces quite a variety of gastrointestinal disturbances, the most important being vomiting. This in all probability is the result of an effort at elimination through the stomach. It may be so intense that, being associated with obstinate constipation, it causes a suspicion of intestinal obstruction. It is a good rule in cases of persistent vomiting to think of uremia, as well as of the gastric crises of locomotor ataxia. Acidosis should also not be forgotten, nor hysteria nor the toxemia of pregnancy.

Another gastric manifestation worthy of note is hiccough. Only the curious epidemic variety of the last few years can parallel in intensity and duration that of uremia. A rare and distressing symptom is salivation. Another to which Howship Dickinson called attention several years ago is a colitis resembling dysentery.

Urinary Symptoms.—As a rule, the quantity of urine is reduced and albumin and tube casts and blood are present. There are cases, however, often of severe type, in which there is an abundance of urine, of low specific gravity, with but

little albumin. The urine in uremia may indeed be entirely free from albumin as in the case of narcolepsy reported above.

(*d*) *Dermal Manifestations.* — Among skin manifestations one of the most distressing is itching. It is well to bear in mind a possible renal cause in all cases of generalized pruritus. "Dead fingers" is also at times a symptom of renal insufficiency. There is a certain complexion in uremic patients that has a suggestive value to the experienced eye. It has been called the cold buckwheat cake complexion—not a bad name for it.

(*e*) *Mixed Manifestations.*—So many possibilities exist that one can do no more than simply state the fact that various groups of symptoms may combine themselves to produce in a given case the clinical picture of uremia. While a combination of symptoms arising from involvement of various organs is the rule, cases are met with in which but a single symptom is outstanding. This is the so-called monosymptomatic uremia in contradistinction to polysymptomatic uremia. It is the monosymptomatic cases that are especially difficult of diagnosis, the uremic basis being often unsuspected.

An obscure symptom not readily classified under any heading is fever. I have already referred to it in speaking of coma. Sometimes it is due to an evident complication such as bronchopneumonia, pericarditis, cystitis, pyelitis. At other times no infective cause can be found, so that we are forced to assume that the fever is of metabolic origin.

Uremic patients often exhale a peculiar mawkish odor that has something characteristic about it.

DIFFERENTIAL DIAGNOSIS

I want now to speak of the diagnosis of uremia, or rather of the differential diagnosis. Typical cases need not detain us. In obscure cases, especially in monosymptomatic types, we must have some general method of approach that will lead us more or less surely to a correct diagnosis. The following scheme for the study of such cases will, I believe, prove useful:

(1) Urine.—Chemistry, specific gravity, day and night quantity, and the Mosenthal test if the condition of the patient warrants it.

(2) Determination of functional activity of the kidneys by the phenolsulphonethalein test—intramuscularly in dry uremia and intravenously in uremia with dropsy.

(3) Determination of nitrogen and chlorid retention in the blood.

(4) Determination of the carbon dioxid content of the blood and of the alveolar air, and perhaps of the hydrogen-ion concentration, as soon as a good clinical method is available.

(5) Examination of the heart and vessels, including blood pressure; search for pericardial effusion.

(6) Examination of the nervous system.

(7) Examination of all other systems and organs, especially search for effusions, enlargement of the liver, etc.

(8) Examination of the eyes—myosis and changes in the eyegrounds.

(9) Careful study of the temperature.

Some of the foregoing are laboratory investigations and cannot be made by every one, nor can they be made in an emergency. But it is within the power of every practicing physician to test the urine, make a physical examination and to take the blood pressure. If the possibility of uremia as a producer of all manner of symptoms in typical and atypical groupings is borne in mind, the diagnosis can usually be made by the simpler traditional procedures.

My revered teacher, Horatio C. Wood, used to say: "In obscure atypical cases always think of syphilis." I would change this to: "In obscure atypical cases always think of uremia and of syphilis."

DIAGNOSIS OF THE ANATOMIC SUBSTRATUM

To determine the underlying cause is not perhaps very important, because as I have already said, so many variations in the pathological anatomy are possible. Nevertheless, we have to strive for greater knowledge, hence we should undertake by all available means to get a mental picture of the diseased kidney. And yet, from the standpoint of immediate treatment and of prognosis, the most important thing to

know is what reserve functional power the kidney possesses rather than whether the connective tissues or the tubules are the more affected.

It should be remembered that renal insufficiency may be a manifestation secondary and perhaps subsidiary to other conditions. It may then be difficult to tell what share it contributes to the clinical picture. In the course of subacute endocarditis, there comes a time when as the result of frequent bacterial emboli or of toxic degeneration of the kidney, albumin, blood, tube casts and perhaps streptococci appear in the urine. Clearly the kidney is becoming insufficient. But who can tell, in the presence of a terrible blood infection, of bacterial deposits in many organs, what share should be attributed to the kidney?

In ordinary cases of chronic heart disease, whether primarily valvular or primarily myocardial, decompensation and the development of dropsy are associated with the appearance of albumin, tube casts, and at times blood in the urine. Many speak of such cases as cardiorenal, but that does not seem to me to be a correct use of the term. The kidney, no doubt, plays a part in the picture, but so do the liver and the gastrointestinal tract, and it would be just as correct to speak of these cases as cardiohepatic or cardioalimentary as to call them cardiorenal.

Josue has recently described them as false cardiorenal cases, which, though not an attractive term, is better suited to the facts.

The eclampsia of pregnancy is closely related to uremia. There is distinct evidence in this condition of the co-involvement of other organs beside the kidney, for there are usually profound structural changes in the liver, perhaps in the ductless glands and elsewhere.

TREATMENT

I shall not undertake a detailed discussion of the preventive treatment of uremia, for that would involve a consideration of the whole subject of nephritis, which is beyond the scope of this essay. It is, however, within its purview to say that the incidental causes capable of precipitating a uremic attack in a case of nephritis should be guarded against in all possible ways, namely, shock, exposure, acute infections, fatigue, indigestion. Focal infections should also be looked for.

With regard to the actual treatment, there are two measures that are applicable to all forms of uremia—purgation and sweating. For purgation, the mercurials are inadvisable. The salines, the natural laxative waters, cascara and senna are most useful. In some cases, especially when grave symptoms are impending, the best remedy is elaterium.

Sweating can be brought about by a variety of means—the hot pack, the hot bath and the electric cabinet. When the skin fails to respond to treatment, it is well to give pilocarpin, grain 1/12 to 1/8, hypodermically, not, however, when there is dropsy or edema of the lungs. Since sweating raises the concentration of the urea nitrogen in the blood, as shown by Pepper, it is advisable to give plenty of water during the sweating treatment.

If there is evidence of acidosis by the tests at our disposal, or failing these tests, if there is deep labored breathing, very similar to that known as Kussmaul's breathing, the alkalis are indicated and may be given by mouth or by rectum.

A word about the treatment of special symptoms. Uremic headache may respond to sweating and purgation; if not, then the best thing is to leach from the mastoid or temporal region or do a general bloodletting from the elbow. When doing venesection, it is well to apply a blood pressure instrument to one arm and bleed from the other until the systolic pressure sinks to 180.

For uremic vomiting, in addition to the measures mentioned, lavage of the stomach is most valuable. Gastric or sometimes duodenal lavage is also one of the best procedures in the case of uremic hiccough. For convulsions, nothing compares with venesection. A large amount of blood should be taken with due attention to blood pressure. Lumbar puncture is also an excellent procedure for the control of convulsions. If they occur too often, chloroform may be used.

I referred to acute pulmonary edema as one of the manifestations of uremic intoxi-

cation. A striking characteristic of this edema is its tendency to recur, as well as its great gravity. It responds, however, as a rule, remarkably well to the proper treatment. This may be summed up as follows: bleeding, dry cupping, morphin and atropin.

The food in uremic poisoning is primarily governed by the condition of the stomach. If that organ is irritable, buttermilk, ginger ale, malted milk or perhaps vichy water is all that may be tolerated. Later, cereals with sugar, toast, apple sauce, junket and sour milk may be added. As the patient improves, the dietetic treatment merges with the general treatment of the underlying Bright's disease. Usually a reduction in the protein intake is advisable, but it should not fall below 50 grams of protein per day. In certain forms, especially those with marked hydremia, Epstein recommends liberal protein feeding.

While it is desirable in hospital patients to control the food intake by the blood studies, in actual daily practice one must be governed by the general condition of the patient and the quantity and quality of the urine.

I have probably given the impression that uremia makes the life of the doctor difficult by its many masquerades. That is true, but by that very token it adds a great deal of interest to the practice of medicine and also offers a greater field for research than almost any other medical condition.

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THE DIET IN CHRONIC NEPHRITIS*

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The kidney has two chief functions: first, to remove from the body the soluble end-products of metabolism; and, second, by means of a wonderfully effective salt exchange, to maintain in the plasma the unvarying osmotic pressure which is essential to cell life. The dietetic treatment of nephritis, by sparing these two functions, endeavors to lessen the work of the kidney.

There is manifested in our efforts to spare the kidney one all-too-prevalent fallacy. We are accustomed to think only of those nitrogenous end-products which result from food intake and largely to ignore the equally important products of endogenous metabolism. Such considerations are of extreme importance.

To illustrate, take the example of absolute starvation. After the person has burned his reserves of glyogen and "deposit" protein he is forced to live upon his own fats and tissue proteins. If he is the possessor of much fat, his metabolism will be largely at the expense of this and only small amounts of protein will be consumed. At no time, however, even in the presence of an abundant store of fat, does the metabolized protein fall below a certain minimum—an amount which in a man of 70 kilos will yield daily an output of about ten grams of urinary nitrogen. To put it another way, at all times during starvation at least 10 per cent of the total metabolism is at the expense of protein. As his body fat disappears such a man oxidizes more and more of his protein until finally, when all fat has vanished, life is maintained solely at the expense of tissue proteins.

This loss of body protein which occurs in starvation can be prevented if the man is given sufficient food. If this food consists solely of protein, in order to preserve nitrogen balance and prevent tissue loss, there is then required an intake of protein which is at least three and a half times that metabolized during starvation. If, however, carbohydrates and fats adequate to meet the calorific needs are also given, a very small amount of protein will suffice, an amount which is even smaller than that metabolized under the most favorable conditions of starvation.

The protein-sparing quality of such a diet depends largely upon the carbohydrates, but as these are too bulky when eaten in large amount it is necessary, in order to provide sufficient calories, to include a certain amount of fat. To secure maximum protein-sparing qualities it is essential that the diet contain always suf-

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ficient carbohydrates to supply at least half the total energy.

The nature of the protein ingested and its source is not without importance, for nitrogen equilibrium cannot be secured with a protein from which is missing any essential amino-acid. No protein or mixture of proteins can preserve nitrogen balance unless it supplies all of those amino-acids which unite to construct the patient's own tissues. Nor can such equilibrium be economically maintained at a low level of nitrogen intake by means of proteins which are merely poor in any of the requisite amino-acids. If a protein which is poor in any important amino-acid, such for instance as tryptophan, be used as the sole protein food, in order adequately to supply the tissues with this "building stone," this protein must be eaten in excessive amounts, and the surplus of other amino-acids incidentally ingested must be oxidized to form unnecessary waste. From a biological standpoint, such a protein is clearly uneconomical.

This biologic value, so called, of a protein depends upon the completeness with which it furnishes all those amino-acids necessary to the building of body tissues. Casein ranks first in this regard, hence the great value of milk. Meats, particularly the glandular organs such as liver, kidney, and pancreas, and eggs rank next, while the proteins of the cereal grains, tubers, and legume seeds are of distinctly less value. When, as in nephritis, we endeavor to maintain nitrogen equilibrium with the lowest safe nitrogen intake, this biologic value of a protein must receive full consideration.

In selecting the food in chronic nephritis it must be borne in mind that this is a disease not of days or weeks but of years, and that it is necessary to prescribe for the patient an optimum diet which not merely spares the kidney but which will for a long time maintain bodily vigor at the highest possible level.

The amount of protein necessary to accomplish this is still a subject for discussion. We recall Voit's original estimate for the average healthy man of 118 grams of protein daily, which estimate was at that time universally accepted. Then came the well known studies of Chittenden upon himself and a number of students, from which studies it was concluded that unusual mental and physical vigor can be secured with a diet which contains only one-third of the protein advised by Voit, approximately 40 grams daily. Many other students of nutrition, notably Benedict, who at first were opposed to this low protein diet, were led later to accept Chittenden's views.

Now comes McCollum, who points to an important fallacy in the Yale investigator's premises. The students upon whom Chittenden and Benedict made their observations lived upon this low protein diet only about nine months, a length of time which McCollum regards as insufficient to warrant far-reaching deductions. McCollum's criticisms are based upon his experience with mice. A protein intake which is just sufficient in mice to promote growth to maturity at the normal rate will serve for a short time to keep the adult mouse in apparent health and vigor. Upon such a minimal protein intake, however, this animal soon loses his vigor, ages quickly, and dies early. To maintain continued vigor and to experience normal longevity the mouse must receive in his diet a generous supply of good protein, a supply which is materially in excess of his theoretic needs. Since the normal span of life of the mouse is only about thirty-six months while that of man is more than twenty times as long, the fallacy in Chittenden's reasoning seems evident. The assumption that the reaction of an individual to a given diet during a brief fraction of his entire life will furnish a fair index to the way in which he will respond to such a diet during his whole span of life, in the light of animal experiment, seems unwarranted. Therefore, it is reasonable to conclude that in order to enjoy optimal vigor and longevity, in health and disease, man should receive a liberal supply of good protein. By liberal is meant an amount well in excess of that necessary to preserve nitrogen balance, and by good is indicated a protein of high biologic value.

The minimal daily protein intake which clinical experience has shown to be safe for the patient with chronic nephritis is 60 grams. Probably 75 grams is better. It is essential that the protein thus per-

mitted be of good biologic quality, and for this reason the cereal grains and vegetables must not be depended upon as sole sources of nitrogenous food. They must be supplemented by proteins of higher quality such as are found in meats, eggs, and particularly in milk. Thus, to secure to the patient a satisfactory protein intake the diet should always contain a certain amount of milk and a mixture of proteins in which is included at frequent intervals a small amount of meat.

Epstein has called attention to a change in the globulin fraction of the blood which takes place in certain forms of chronic nephritis. He believes that he can remedy this and benefit the patient with a high protein diet. My experience with such a diet is insufficient to warrant a definite opinion, but in a few instances it has seemed to me that such a diet was of value.

Something should be said in passing of the widely prevalent custom of telling a patient with chronic nephritis or indeed with vascular hypertension that he must eat no meats, for much needless harm follows such advice. Another custom which requires comment is that of distinguishing in the diet of this disease between red meats and white meats. As far as it concerns the metabolic end-products which reach the kidney there is not the least difference between red and white meats. On the other hand, the interdiction against broths and meat soups should be emphasized, for these contain meat extracts which are of no calorific value and which throw additional burden upon the kidney.

After an appropriate intake of protein is assured, an abundant supply of carbohydrates should be planned, and there should be added fats sufficient to bring the total value of the diet in a man, say of 70 kilos and sedentary habits, to about 2500 calories. The source of the carbohydrates and fats is of importance. A certain amount of these is secured in the milk, cream, and butter which the patient should always receive. Cereals, bread, potatoes, and preserves are valuable because of their carbohydrates, but these should not be eaten to the exclusion of other carbohydrate foods such as green vegetables, particularly the leafy vegetables. Fats are best taken in the form of cream and butter.

No discussion of diet is complete without mention of the importance to the human economy of a generous supply of vitamins. The patient who secures his carbohydrates from the cereal grains, tubers, and legume seeds, and his proteins from muscle meats is apt to have superimposed upon his nephritis some of those vague disorders which result from chronic vitamin deficiency. If, as advised above, he will include in his diet sufficient quantities of milk, fruits and the leafy portion of vegetables, and as sources of protein will perhaps eat a certain amount of the often despised liver, kidney, or sweet breads, he will escape the ills of vitamin deficiency.

Since one function of the kidney is to regulate sale exchange, and since the ability of the sick kidney to excrete certain inorganic salts is at times impaired, the diet should be arranged with some thought as to its mineral content. Attention has been repeatedly called to the failure of the average American diet to supply a sufficient amount of calcium, and since this element is an important component of certain body tissues, this is a serious fault. Milk, again, because of its richness in calcium, is of value in making up this deficiency.

In a disease one feature of which is the abnormal production of acid, consideration could with advantage be given to the acid or base forming properties of the patient's food. Among the vegetables the base-forming ash of the potato is of preeminent value. It is said that apples, raisins, and bananas in this regard are likewise useful.

Chlorid intake has been the subject of much discussion. Recently it has been suggested that chlorid restriction as ordinarily practiced is not sufficiently rigid. However, from certain experimental observations which I recently published, it was concluded that the almost total elimination of chlorids from the food accomplishes nothing more than does the less rigid restriction at present in vogue. I

understand that others who have studied the influence of chlorid restriction in nephritis have reached similar conclusions. The restriction of salt is adequate when the patient is told to eat unsalted butter, to add no salt to his food after it reaches the table, and to eat no unusually salty food such as bacon. Thus he will receive the equivalent of about two grams of NaCl daily, an amount which we believe the kidney can easily excrete.

The pendulum of opinion concerning the drinking of water in chronic nephritis has swung back to the midline. The drinking of a reasonable amount of water does not raise blood pressure or harm the kidney; nor conversely has it been shown that good has ever been accomplished by the old practice of drinking enormous quantities of water. Therefore, it seems best to advise a moderate fluid intake of about three to five pints daily, the amount depending somewhat upon the climate and the resulting loss of fluid through the skin.

To secure maximum nutritive efficiency the digestive organs should be protected against abuse. The food should be simple. Pies and other pastries, fried food, all complex, highly seasoned "made dishes," should be interdicted. It is advisable that constipation be prevented and for this reason the diet should include always a sufficient amount of honey, fruits, vegetables, bran and other laxative foods.

Lastly, concerning the practical arrangement of the diet, the patient with chronic nephritis, as with diabetes, should be educated in the rudiments of the science of nutrition. He should be told the aims of dietary regulation and should receive elementary instruction in the chemical nature and the biologic properties of the various foodstuffs. Methods of computing food values should be taught the patient and with the aid of some book on the subject such as that written by Locke, he should learn to arrange his own diet. He should receive general instruction and specific rules rather than specific daily diet lists.

THE RELATION OF ACIDOSIS TO NITROGEN RETENTION IN EXPERIMENTAL NEPHRITIS*†

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The association of a reduction of the titratable alkalinity of the blood with certain forms of kidney disease has been recognized for the past thirty years. Not a few investigators have assumed that this reduction of the blood's alkalinity was responsible for the injury to the kidney. Basing his conclusions on most careful experiments, MacNider has particularly emphasized the occurrence of acidosis in dogs poisoned by uranium nitrate or by mercuric chlorid, and has observed that the administration of alkali in amounts sufficient to keep the reserve of the blood at its normal level seems to lessen the damage to the kidney as seen microscopically. Other investigators have attempted to explain the intoxication by methyl alcohol chiefly on the basis of the acidosis which may follow toxic doses of this alcohol. Reference to the modern literature dealing with the treatment of clinical cases of poisoning by both mercuric chlorid and methyl alcohol shows that many physicians advocate "alkalinization" as a procedure of much importance.

Previous experiments of one of us upon dogs poisoned by methyl alcohol showed that while a reduction in the alkali reserve of the blood frequently occurred, yet the degree of acidosis and the severity of the intoxication did not always vary in the same direction. In certain instances of severe or even fatal poisoning, the alkali reserve was found to remain at a high normal level to within a very short time before the death of the animal. In other cases, a marked reduction in the alkali reserve was unaccompanied by evidence of severe intoxication and the animal subsequently recovered. Furthermore, our re-

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sults from alkali therapy in dogs poisoned by methyl alcohol were such as to lead us to doubt not only the efficacy of this therapeutic measure, but also to question the belief that a reduction of the alkali reserve actually determines the severity of the intoxication.

In our experiments with mercuric chlorid, we have found that if a dose sufficient to kill an untreated dog be injected subcutaneously it is often possible to save the animal by the intravenous and subcutaneous injection of isotonic salt solution. In our hands, the addition of bicarbonate of soda to such solutions appears to possess no advantage. Indeed, the animals that have received such alkaline solutions have shown a higher mortality rate than those receiving the plain saline.

Recognizing the fact that acidosis does occur in mercuric chlorid poisoning, with structural changes in the kidneys, the question arises: is the reduction in the alkali reserve the cause of the damage to the kidney, or is it, along with the nephritis, the result of a common cause? Burmeister and McNally have shown that massive doses of mercuric chlorid given orally may produce structural changes in the kidney within three minutes. We have been able to show that there occurs no appreciable reduction in the alkali reserve of the plasma after almost an hour subsequent to the intravenous injection of a fatal dose of mercuric chlorid. Furthermore, in dogs that have received large doses of mercuric chlorid intravenously, the reduction in the alkali reserve is much less striking than the coincident increase in the nitrogen of the blood. This relationship is clear from the figures given in Table I.

TABLE I.

Relationship Between Alkali Reserve, Urea Nitrogen and Total Non-Protein Nitrogen of the Blood in Dogs Poisoned by Mercuric Chlorid.

Dog. No.	CO_2 Cmbg. Power of Plasma in Vols. per cent	Urea N. in Mg. per 100 c. c. Blood	Total N. P. Nit. in Mg. per 100 c. c. Blood
3—Normal state	64.3	15.0	27.3
24 hours later	59.7	40.5	63.3
48 hours later	56.9	90.0	103.3
72 hours later	51.4	120.0	153.0
96 hours later	52.2	150.0	189.0
120 hours later	46.7	225.0	265.5
4—Normal state	64.3	9.0	26.1
24 hours later	61.6	14.5	25.0
48 hours later	56.9	49.5	88.2
72 hours later	46.7	124.5	199.5

Results very similar to those tabulated have been obtained in six other dogs, but are not given, since they show nothing more than appears in the above table. It is apparent from these figures that, although there is a reduction of the alkali reserve, it is relatively insignificant in comparison with the increase in the nonprotein nitrogen of the blood. It is well recognized that considerable damage to renal structure may be present without leading to appreciable retention of the nitrogen in the blood. In other words, the increase in the blood nitrogen occurs relatively late, some time after the initial anatomical changes in the kidney. Therefore, from the results that have been presented in Table I, we should have to conclude that a very slight decline from the average alkalinity of the blood suffices very rapidly to cause histological alterations in the cells of the kidney if we would adhere to the view that the acidosis is responsible for the renal changes.

In the case of one dog poisoned by the intravenous injection of three and a half milligrams of mercuric chlorid per kilogram intravenously, results have been obtained which would seem to indicate that decreased functional power of the kidney occurred before there was any reduction of the reserve alkali of the blood. The changes which occurred in this animal's blood are shown in Table II.

TABLE II.

Impairment of Renal Function Without Acidosis in Mercury Poisoning.

Dog No.	CO_2 Cmbg. Power of Plasma in Vols. per cent	Urea N. in Mg. per 100 c. c. Blood	Total N. P. Nit. in Mg. per 100 c. c. Blood
1—Normal state	61.6	13.5	29.4
24 hours later	64.3	30.0	63.0
48 hours later	60.6	106.5	148.5
72 hours later	54.1	150.0	177.0
96 hours later	54.1	166.0	193.5
120 hours later	47.5	176.2	240.0

The normal carbon dioxid combining power of the plasma of this dog was 61.6 volumes per cent. Twenty-four hours after the injection of the mercury it had risen to 64.3 volumes per cent, and, despite this, the nitrogen of the blood showed a definite increase. In this case, therefore, we are forced to the conclusion that renal injury occurred before a reduction of the reserve alkali of the blood; or, else, there was a temporary reduction and a subsequent temporary rise of the alkalinity of the blood. That such an occurrence is not impossible may be seen in the case of Dog 3, in Table I; the alkali reserve being higher 96 hours after the mercury administration than it was at the end of 72 hours, to fall much lower in 24 hours more.

The results of alkali therapy in dogs poisoned by the subcutaneous injection of mercuric chlorid have been disappointing, so far as enabling us to prevent a fatal outcome. In a few cases we have studied the influence that alkali administration may have on the blood changes which follow the intravenous injection of large doses of mercuric chlorid into dogs. Similar experiments have been performed by Goto, alkali administration being tried in various forms of experimental nephritis without very definite influence being exerted on the nitrogen retention.

In our experiments designed to show the effect of alkali administration on the blood changes following intravenously injected mercuric chlorid, two animals were used: one (Dog 18) received a dose of 3.5 mg. of the salt per kilogram, and the other (Dog 16), 4 mg. per kilogram. The first animal recovered and the second succumbed on the third day. Precisely similar changes occurred in these animals as did in the controls, so far as the nitrogen retention was concerned, in spite of the fact that the alkali reserve was kept at a persistently high level. The results of the analyses are given in Table III.

In the animals which we have used, spontaneous recovery has followed the injection of the dose of 3.5 mg. of the mercuric chlorid in a number of instances, while all untreated animals have succumbed to the dose of 4 mg. per kilogram.

TABLE III.

Influence of Alkali Administration on Blood Changes in Dogs Poisoned by Intravenous Injection of Mercuric Chlorid.

Dog No.	CO_2 Cmbg. Power of Plasma in Vols. per cent	Urea N. in Mg. per 100 c. c. Blood	Total N. P. Nit. in Mg. per 100 c. c. Blood
18—Normal state	68.0	12.6	24.9
After $NaHCO_3$* $HgCl_2$ injected	81.5	.....	.....
At end of 24 hours	80.6	60.0	78.0
At end of 48 hours	57.0	107.0	130.0
$NaHCO_3$ injected	68.0	.....	.....
At end of 72 hours			
$NaHCO_3$ injected	74.9	105.0	136.0
16—Normal state	53.2	14.4	27.0
After $NaHCO_3$ $HgCl_2$ injected	125.2	.....	.....
At end of 24 hours			
$NaHCO_3$ injected	81.5	46.2	74.1
At end of 48 hours			
$NaHCO_3$ injected	93.2	90.0	166.0

*In each instance 5 c. c. of 10 per cent sodium bicarbonate per kilogram of body weight.

It would seem fair to assume that, if the reduction of the alkali reserve that occurs in mercury poisoning is actually the cause of the depressed renal function, a similar reduction of the reserve by other means would have a similar effect. In order to determine this, two dogs were placed in metabolism cages and deprived of all food for twenty-four hours. In the case of one of the animals this sufficed to reduce the CO_2 combining power of the plasma from an initial level of 51.3 volumes per cent to 48 volumes per cent; while the blood nitrogen showed no increase. The alkali reserve of the second dog showed no change as a result of the fast. Both animals were then given 1 c. c. of dilute hydrochloric acid per kilogram orally, with the result that the dog that had previously showed no decrease in the reserve alkali now showed a diminution to 46 volumes per cent, the initial reading having indicated a combining power of 49.4 volumes per cent. Here also there was no increase in the total non-protein nitrogen nor in the urea nitrogen of the blood.

These results that we have already obtained appear to indicate quite clearly that the "acidosis" is certainly not responsible for the severity of the intoxication by

methyl alcohol or by mercuric chlorid in some cases, at least. Not only is the reduction of the reserve alkali relatively slight in the beginning, but evidence of renal damage may be obtained before there is any decrease in the alkali reserve at all. Furthermore, when the reserve alkali is kept at a high level by the intravenous injection of sodium bicarbonate, little effect seems to be exerted on the course of the poisoning and the impairment of renal function. Finally, a reduction of the alkali reserve through starvation and administration of dilute hydrochloric acid, though fully as great as that seen early in the course of poisoning by mercuric chlorid does not lead to a retention of nitrogen which is seen in this latter condition.

We are convinced not only that sodium bicarbonate therapy is useless in certain cases of mercuric chlorid poisoning, but unless great care is exercised in its intravenous injection serious damage or even death may ensue. In the paper previously referred to it was shown that the intravenous injection of solutions of bicarbonate of soda into dogs in doses quite comparable to those occasionally recommended for clinical use may give rise to convulsive seizures and immediate or delayed death. Similar occurrences have been noted following the clinical employment of intravenous bicarbonate therapy, so it should be realized that this form of therapy is by no means devoid of danger. We feel that it cannot be too strongly stressed that alkali administration in supposed cases of acidosis should be resorted to only when it has been definitely shown that there is a reduction of the reserve alkali of the plasma and, even then, oral or rectal administration should be preferred to the injection of the solution intravenously.

DISCUSSION

Papers of Dr. Riesman, Dr. McLester and Drs. VanderHoof and Haskell.

Dr. Louis Hamman, Baltimore, Md.—Some progress has been made toward the solution of this riddle during the past ten or fifteen years. This progress consists in our now being able to state the riddle somewhat more precisely and more clearly. Uremia originally meant intoxication due to a piling up of urea in the blood. We now know that retention of urea is not the cause of the symptoms of uremia, but the time-honored term is retained and used to imply an intoxication due to substances retained in the blood consequent to seriously impaired renal function. Uremia, therefore, is the term used to designate a group of intoxication symptoms associated with renal insufficiency. This seems clear enough and yet in practice the greatest confusion has arisen by including under uremia a whole host of symptoms that bear no direct relation to renal insufficiency. Almost every symptom a patient with nephritis may have has been termed uremic. It is important to emphasize that there is a characteristic group of symptoms which should bear the name uremia, and also that there is a large group of accessory or associated symptoms which also occur commonly in the absence of renal insufficiency and therefore are not uremic.

The classical symptoms of uremia are lethargy, gradually progressing to coma, increased reflexes and muscular twitchings, stertorous breathing and often hyperpnea, anorexia and vomiting, a urinous odor to the breath, headache and a rise of blood pressure and a tendency to certain infections, chiefly stomatitis, enteritis and pericarditis. Symptoms often associated with uremia but which occur still more frequently in the absence of renal insufficiency and are not necessarily due to intoxication are convulsions, transient cerebral symptoms such as aphasia, hemiplegia, hemianopsia, etc., psychic disturbances such as mania, hallucinations, etc., paroxysmal dyspnea, pulmonary edema, Cheyne-Stokes breathing and many others.

While genuine uremic symptoms are due, we believe, to retention intoxication, the latter or pseudo-uremic group are associated particularly with vascular changes. They occur with greatest frequency in association with hypertension and arteriosclerosis and are often preceded by marked rise of blood pressure, so-called blood pressure crises. I cannot stop to discuss the mechanism of production of these symptoms other than to say that many of the cerebral symptoms, especially the acute eclamptic convulsions, are no doubt due to edema. An analogue are the attacks of suffocating pulmonary edema which come on with singular abruptness and disappear as rapidly as they come. Some of the transient symptoms may be due to angiospasm. It is perhaps important to emphasize again that convulsions are uncommon in uremia and that acute eclamptic convulsions are not uremic manifestations. Dr. Riesman has commented upon the difficulty of distinguishing between the cerebral symptoms due to temporary circulatory disturbance and those due to hemorrhage or thrombosis. There is no sure way to distinguish them, and transient attacks often precede the occurrence of hemorrhage or thrombosis. However, if the distinctions I have indicated are borne in mind, there is seldom difficulty in distinguishing between cerebral vascular accidents and uremia.

Such a division of symptoms clarifies the problem and makes an investigation of uremia simpler. We are not justified in speaking of uremia unless modern methods of blood analysis reveal definite nitrogen retention. If the manifestations of renal disease are studied by modern methods, then we shall soon have a more concrete definition of ure-

mia shorn of the host of associated symptoms in no way characteristic of uremia.

Dr. Elsworth S. Smith, St. Louis, Mo.—At our clinic in the Washington University Medical School we have studied two groups of cases of arterial hypertension with nephritis, one hospital, the other ambulatory, and these were then further divided into those which did not and those which did show renal insufficiency. Our results are as follows:

Group 1.—Twenty-five compensated hospital cases studied for three weeks, when put on a regime of rest, diet and elimination, presented a steady declining blood pressure curve from 205 to 140 systolic and 110 to 90 diastolic without the slightest disturbances in renal compensation.

Group 2.—A group of 30 hospital cases, also studied three weeks, and which showed different grades of renal insufficiency, when placed on the same regime, likewise presented a steadily declining blood pressure curve. These showed not only no increase in the renal decompensation, but an actual improvement, as evinced by a diminution in quantity of albumin and number of casts with a rise in the phenosulphophthalein kidney function test and a lowering of the non-protein blood nitrogen.

Group 3.—There was a compensated ambulatory group which, when submitted to the same regime, gave the same results as seen in Group 1, representing the hospital cases.

Group 4.—This was a group of decompensated ambulatory cases showing on submission to the same regime as the other groups results identical to those seen in Group 2 of the hospital cases.

The pressure curves in all these groups were based on the average daily blood pressure in each group of cases.

While it may be contended, therefore, by some, that arterial hypertension is compensatory and conservative in nephritis and that any lowering of the blood pressure will increase renal insufficiency, still it seems to us from our study that lowering of blood pressure does not cause or increase renal decompensation, but rather improves the decompensated kidney because it improves the circulation through helping the laboring heart. The point I wish to bring out especially in Dr. Riesman's paper is that nephritis is not always the cause of hypertension, and therefore that hypertension is not necessarily of renal origin in all cases. It may be the actual cause of nephritis in a rather large proportion of these cases through production of arteriosclerosis of renal arteries and consequent arteriosclerotic nephritis.

Dr. W. H. Olmsted, St. Louis, Mo.—If uremia is the result of decompensation of the kidney, we should have in the blood evidences of that decompensation; in other words, an accumulation of urea. The blood non-protein nitrogen is the easiest procedure to show that. It is not very difficult to do and is of great help in differentiating from true uremia those symptoms that are often confused, as Dr. Hamman says, with it. Unless there is retention of nitrogen in the blood stream, we cannot frankly call it uremia, but retention of nitrogen in the blood is often seen without the symptoms of uremia.

We have carried out in the past two years about 800 determinations of blood non-protein nitrogen. I was interested to see what became of the cases which showed a frank retention of urea. In these determinations about one hundred patients showed non-protein nitrogen which represented a frank retention. I divided them into three general groups: the first group, chronic nephritis; the second group, heart decompensation, as shown by functional tests, which was of more importance than kidney disease; and the third group, that in which there were infectious processes in the kidney.

Of the nephritics, 63 per cent died in the hospital and only 9 per cent showed a return of the non-protein nitrogen to the normal level. Of the cardiac cases, 50 per cent showed a return to normal level and 50 per cent died. In other words, the kidney is not the deciding factor in such cases. The third group, infectious kidney disease, showed a return to normal level of the non-protein nitrogen in 50 per cent of the cases and 50 per cent completely recovered. In other words, the interpretation of nitrogen retention depends on what process is back of the retention. This is a rather important point.

Another thing of great value is the determination of the cardiac factor. In a case where we have symptoms of so-called "wet" uremia showing non-protein nitrogen between 40 and 50, one can be sure that the main factor is the heart and not the kidney. That is an important index for treatment, because in such cases treatment should be directed toward the heart rather than toward the kidney. Especially is this true in deciding the question of the proper amount of water to give the patient. When the heart is mainly involved, harm is done by forcing water, whereas with kidney disease one gives the kidney enough water so that it will perform its function properly.

Dr. Frank A. Jones, Memphis, Tenn.—From recent studies of blood chemistry and kidney function, the question of diet in any form of Bright's disease is as much of a riddle as is uremia in nephritis.

Two of our foremost men (Mosenthal and Epstein) have reversed themselves in the matter of diet. In other words, they have convicted themselves with reference to their previous views. It is not so long ago that Alexander Haig wrote on this subject, so that we do not know really where we are in the matter of diet in any form of Bright's disease.

As to whether we will confine ourselves to certain stipulated conceptions as to what we shall give in the way of foods in the different forms of Bright's disease depends upon blood chemistry and kidney function, and what our psychological attitude toward the whole question is. It might be well if in this review of the question we mingle the old with the new, and be not the last to give up the old and not the first to take up the new.

The question of diet in nephritis today is as much overdone as was starvation in diabetes or the question of not giving anything in typhoid fever twenty-five years ago.

You must mix experience and judgment with theory and art with science. In addition to the theory about treatment for Bright's disease we should use two textbooks: Swedenborg on "Rational Psychology" and Lord Bacon's "Inductive Philosophy." And then we should read the thirteenth chapter of Corinthians on faith, hope and charity.

Dr. Stewart R. Roberts, Atlanta, Ga.—I want to give vent to a few clinical impressions on Dr. Riesman's paper. He called attention to rapid respiration in those individuals who have signs of cardiovascular renal disease. I remember one case Dr. Paullin and I together saw in a gentleman with arteriosclerosis and mild hypertension in whom a rapid respiration was the first objective clinical sign of an oncoming uremia. It is a symptom that is rare, but one we may well take note of—rapid respiration without apparent objective cause in one with vascular involvement.

Another very interesting clinical phenomenon in uremia is the unilateral convulsion. Of course, we are all aware that unilateral choreas do occur, unilateral tetanies, and unilateral myoclonic conditions, such as convulsive tic, and unilateral convulsions in tetany, while also rare, are of great clinical interest.

I have not seen in my own individual experience a patient with uremia with the neuromuscular or twitching form who ever got up out of his bed or away from his room. In my experience twitchings of the muscles are universally of serious prognostic import and tend to early death.

I would like to accentuate one custom in the South that is followed too freely and apparently without clinical consideration, namely, giving large doses of calomel in uremia. We probably with due respect to ourselves in the Southern states have the calomel habit, and large doses of calomel in any form of uremia, even of the mild type, are severely contraindicated. A saline is so much better. Furthermore, we tend to give too much calomel in the so-called bilious states, whatever they are. And those attacks called biliousness by the patient, if accompanied by periodical attacks of nausea, and more particularly if in that patient there is early morning headache associated with chronic hypertension, may be but a symptom of periodic uremic states.

I would like also to accentuate a point Dr. McLester made, and I do want to agree generically with Dr. Jones that we are probably in the twilight zone relative to the clinical application of dietary problems of nephritis and the uremic states. I agree with Dr. McLester that it is well to avoid the old English use of broths and meat soups in nephritis and uremic states. There is just as much nourishment and as much poison in an equal amount of urine.

I want to call attention lastly to a point that Dr. Riesman made relative to the value of lumbar puncture in the transient hemiplegias of uremia. While one in his clinical lifetime has but a moderate experience with this procedure, I have been impressed with the possible diagnostic value of an acute rise in blood pressure in one who already had had hypertension in these so-called transient hemiplegias, and the rapidity with which the blood pressure drops after a lumbar puncture. One might do a lumbar puncture in such a state without fear and without danger and without pain to the patient. I have also had the impression, although unable to prove it, in these transient hemiplegias and monoplegias where there is a sudden rise of blood pressure, particularly the systolic pressure, that it is usually greater than in the true cerebral hemorrhage; or to put it differently, in the hemiplegia due to an actual apoplexy. It would take time to prove this point, but I am certainly convinced of the ease and the value of lumbar puncture in the transient hemiplegias of uremia.

Dr. W. McKim Marriott, St. Louis, Mo.—In the consideration of nephritis and uremia in the past we paid too much attention to the kidney and too often lost sight of the fact that the clinical condition referred to as "nephritis" is in reality a general disease, of which the kidney is only one of the organs effected. We now know that certain substances usually classed as kidney poisons exert their effects to almost the same degree in animals from whom the kidneys have been removed as in normal animals. The work of Wallace in New York has clearly demonstrated this fact. We know, furthermore, that complete removal of the kidneys does not lead to all the characteristic symptoms of nephritis.

In that form of nephritis referred to as the "wet" or "dropsical" type changes have taken place in many of the cells and fluids of the body. There is a change in the surface tension of the fluids and a change in the permeability of the cells. These changes affect the cells of the renal parenchyma, especially the tubules in a similar way with other cells of the body. These patients are not edematous because the kidney fails to excrete water. They are edematous because the tissues hold the water and consequently there is very little for the kidney to excrete. This form of nephritis is brought about by cellular poisons among which are certain bacterial toxins. The successful treatment of the condition is dependent upon preventing these poisons from entering the body. If this can be done the condition will clear up and unless it has lasted too long there will be no permanent damage to the kidney or other portions of the body. It has been our experience with this type of nephritis in childhod that many of the patients are suffering from infection of the nasal accessory sinuses. In a fairly large series we have observed disappearance of the edema and the excretion of a normal urine following the clearing up of these sinus infections. This we have repeatedly seen occur even when no changes whatsoever were made in the diet. In fact, the dietary treatment of this form of nephritis, ordinarily referred to as the acute parenchymatous type, is very unsuccessful. The nasal accessory sinuses are only one of the places in which the source of infection may be found. It is a very frequent source in childhood.

In the interstitial type of nephritis a true inflammatory condition of the kidney with fibrosis has occurred. The damage here is irreparable and treatment can be only palliative.

I would like to say a word in reference to Dr. VanderHoof's paper regarding the acidosis of ne-

phritis. The type of nephritis in which acidosis occurs is a more serious type than that we have been discussing. There is here a definite failure to excrete various substances among which is acid phosphate. It is only late in the disease that retention of phosphate occurs, and hence the appearance of acidosis is of grave prognostic import, as it is an indication of an extreme degree of renal insufficiency. The patients do not usually die from the acidosis. The administration of alkalis will correct the slight degree of acidosis, but does not hasten the patient's recovery. The retention of acid phosphate not only leads to acidosis, but also brings about a diminution in the calcium content of the blood. Administration of alkalis to such patients still further lowers the blood calcium and this not infrequently leads to symptoms of tetany and a tendency to hemorrhages. The tetany results in convulsions. For these reasons alkalis are contraindicated in the acidosis of nephritis. The administration of calcium salts is of some benefit, as this tends to restore the blood calcium and to remove from the body the excess of retained phosphate.

Dr. McLester (closing).—I think we all recognize that we do not know everything about diet in nephritis or in other diseases, but I am not prepared to admit, as has been suggested today, that the picture is hopeless. It occurs to me that things sometimes look dark and uncertain to the individual whose vision is cloudy, or who for other reasons cannot see well.

ATROPHIC CONDITIONS CONTRASTED WITH MUSCULAR WASTING FROM EMACIATION*

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Probably the least understood diseases in the whole realm of medicine are the atrophies, dystrophies, myopathies and certain of the nutritional muscular disturbances. It is not within the province of this paper to consider adequately the various forms of these conditions or, in fact, to give a detailed description of any form or forms. My intention, based upon a review of the literature and clinical experience, is to attempt a simplification of the classification and gain a clear understanding of these conditions, the very nomenclature of which, whether bearing the personal names of early investigators, or anatomical or other designations, is, to say the least, awe-inspiring.

The most direct method of approaching the problem is to group and define the conditions under consideration.

(1) *The Atrophy Group.*—This group is marked by progressive muscular wasting, with motor weakness due to degeneration in the anterior horns of the spinal cord, followed by degeneration of the motor nerve roots and nerves to the muscles. Usually the spinal degeneration ascends the cord to the medulla giving the syndrome known as bulbar palsy. To this group belong progressive muscular (spinal) atrophy, the hereditary types of spinal and neuro-spinal atrophies, glosso-labio-laryngeal paralysis and amyotrophic lateral sclerosis. These diseases bear various other names, but the ones selected here appear to be the most descriptive.

(2) *The Dystrophy-Myopathy Group.*—Sir James Purves Stewart does not distinguish between dystrophy and myopathy, which greatly aids us in attempting a simpler classification. There is no reason to distinguish between the two. Dorland's "Medical Dictionary" gives the definition of dystrophy as a progressive atrophy of muscles with no discoverable lesion of the spinal cord, and of myopathy as any disease of a muscle. These are certainly indistinguishable because in both the disease is of the muscle fibres themselves. The myopathies and dystrophies embrace both those cases in which there is only muscle wasting and those in which pseudo-hypertrophic changes take place. To the class marked by wasting belong the juvenile shoulder girdle and upper arms type of Erb, the facio-scapulo-humeral type (Landouzy and Dejerine), where the wasting begins in the face, and a type which affects mainly the anterior thigh muscles. To the pseudo-hypertrophy class belongs the condition known as pseudo-muscular hypertrophy.

(3) *The Pseudo-Atrophy Group.*—This group is subject to four subdivisions: (a) those in which muscle wasting is due to malnutrition; (b) those in which it is due to hysterical paralysis; (c) those in which it is due to disease; and (d) those in which it is due to endocrine conditions.

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Of course any combination of these subdivisions is possible.

Having cleared the field thus far, let us proceed with a brief discussion of the three main groups mentioned, paying especial attention to the first and last.

THE ATROPHY GROUP

The first thing that we should realize is that the atrophies of this group are always organic and due to definite lesions, and the second is that these lesions always affect some part of the lower motor neuron, i. e., the neuron from and including the anterior horn cell in the gray matter of the cord ending in its peripheral nerve distribution in the muscle fibre. Atrophy, except the so-called atrophy of disuse, does not occur when the lesion is in the upper motor neuron alone, i. e., the neuron from and including the cerebral cortical cell to, but not including, the anterior horn cell. In other words, when the upper motor neuron is affected and atrophy occurs, as in amyotrophic lateral sclerosis, the lower motor neuron must, either primarily or as a complication, also be affected. True progressive atrophy, as shown by Dana, may occur in cases of locomotor ataxia, but, when this is so the anterior columns are affected by pathological changes affecting the lower motor neuron in addition to the changes in the posterior columns.

In my opinion, with the exception of four rare hereditary forms of progressive muscular atrophy, the Werding-Hoffman infantile form, the Dana adult form, the Charcot-Marie-Tooth peroneal type and the Dejerine-Sottas interstitial neuritic type, which seem to have a definite familial relation, all progressive muscular atrophies are due to streptococci (rheumatoid), spirochetes (luetic) or other infection, or to lead or other poisons unless, indeed, in rare instances trauma may be a causative factor. Not for an instant do I believe that such causes as mental strain, over-use of certain muscles, or exposure, mentioned in many text books, have anything to do with the etiology of progressive muscular atrophy. The rare hereditary cases may be explained by defective lower motor neuron development.

To this true atrophy group belong certain distinguishing features that do not accord with either the dystrophy-myopathy or the pseudo-atrophy group. These features are the presence of fibrillary twitchings, motor neuron changes, early decreased response to both Galvanism and Faradism followed later by partial or complete reaction of degeneration and complicating bulbar palsy. When, in addition, the case shows progressive atrophy and weakness, no pseudo-hypertrophy, myotatic irritability, lack of objective sensory change and wasting of the thenar and hypothenar and other hand muscles, there is little difficulty of diagnosis. True progressive atrophy never begins generally, but usually in the hands or hand or some other special muscle groups. Only in the very late stages does the wasting seem general. For a description of the various types of this group one is referred to the text books.

In considering the treatment we should look for focal infection, syphilis, lead or other metallic poison. If no causative factor can be discovered the treatment becomes entirely supportive and symptomatic.

THE DYSTROPHY-MYOPATHY GROUP

When considering this group, whether marked by either muscular wasting or pseudo-hypertrophy, it should be remembered that the conditions are congenital, no matter at what age the symptoms first appear. However, in distinction from atrophy, the patients are usually younger; also, with the exception of rare forms of hereditary atrophy already mentioned, progressive muscular atrophy has no familial relation while dystrophy-myopathy conditions do. The group under consideration affects the large muscles, the hands usually escaping, while the hands are frequently first affected in progressive muscular atrophy. In dystrophy-myopathy, unlike atrophy, pseudo-muscular hypertrophy and rarefaction of the long bones may take place. Sensory changes and fibrillary twitchings do not occur in dystrophy-myopathy cases and neither does reaction of degeneration, although a general lessening of electrical excitability is present.

The etiology of dystrophy-myopathy cases is unknown and therefore the treatment is simply supportive.

THE PSEUDO-ATROPHY GROUP

(*a*) *Those in which muscle wasting is due to malnutrition.*

Some eight years ago a young man was brought into my office the picture of a walking skeleton. He had been diagnosed as having progressive muscular atrophy. He had no fibrillary twitching, no myotatic irritability, and no reaction of degeneration. The wasting was general, there was no familial relationship, no motor neuron change, and no bulbar symptoms. The patient had a gastritis. Appropriate diet and massage made him a normal man in a few months.

This case illustrates extreme emaciation with preserved ability to walk about. The point is that malnutrition cases only resemble true atrophy and the moral is, the diagnosis of progressive muscular atrophy should never be made upon resemblances only.

(*b*) *Those in which pseudo-atrophy is due to hysterical paralysis.* Hysteria may present either general muscle wasting, in which malnutrition and malassimilation play a large part, or local pseudo-atrophy connected with hysterical paralysis, in which the chief role is played by disuse. Like other hysterical manifestations, this condition may resemble true atrophy, but never exactly similates it. The signs of organic disease are absent and other symptoms of hysteria are usually present. It is more common in one extremity and rarely assumes the shoulder or pelvic girdle type, or the peroneal type. Fibrillary twitchings and reaction of degeneration are absent. In spite of these facts it has been mistaken for organic progressive atrophy. Treatment directed toward the psycho-neurosis combined with massage and Faradism over the affected parts usually cures the condition.

(*c*) *Those in which pseudo-atrophy follows disease.* Arthritis is frequently followed by local atrophy. It is always well to examine carefully the joints in the neighborhood in any case of atrophy. Muscle wasting of this type may follow fracture and is seen at times in hemiplegic limbs, even out of proportion to the paralysis. I had a case of muscular wasting following typhoid fever which affected the shoulder girdle more than the muscles elsewhere. This wasting was greatly benefited by massage and proper nourishment. Mineral poisons may at times give a pseudo-atrophy without organic signs. I recall a very marked lead case, which, upon salicylates, iodids and massage, entirely recovered; and another, in a patient in whom the legs were chiefly affected, in which the patient gained forty-one pounds in a few months. In the first case lead was not at first suspected, but later was discovered in the blood and urine. The patient had absorbed the lead while pregnant by painting with lead paint. The offspring was apparently not affected. The second case had neuritic symptoms in the legs, which made it a mixed organic and non-organic type, and the source of the lead, after diligent inquiry, was found to be subacetate of lead pills which she had taken for over a year because she thought "they were doing me good." Treatment in this group is directed toward the cause as well as the wasting and is not infrequently efficacious.

(*d*) *Those cases in which pseudo-atrophy and myopathy-dystrophy are due to endocrine disturbance.* Many suggestions have been made relating to atrophies, myopathies and dystrophies and their connection with endocrine disturbance. Brock and Kay[1] reported one case of muscular increase and two cases of myotonia congenita thought to be due to polyglandular disturbance. Timme[2] stresses the importance of pineal disorder in progressive muscular dystrophy and also disorder of the pituitary, thyroid and ovaries. The writer fed two cases of pseudo-muscular hypertrophy upon thymus gland extract with some improvement. Gonads and certain castrates often have very considerable muscle wasting, especially marked, it seems to me, around the pelvis. This wasting may improve, especially in young patients, on the administration of the indicated endocrine extract. Hyperthyroidism is, at times, accompanied by marked muscle wasting which improves when the thyroid is adequately treated or operated upon.

Upon the whole, however, not enough work upon the relationship of endocrinology with atrophies and myopathy-dystrophies has been done to draw definite deductions.

In conclusion, I desire to state that I have attempted to simplify the whole

subject of muscle wasting, both organic and non-organic, in order that our approach may be less awe-stricken and our conception less confused. If I have only partly succeeded I shall be gratified.

REFERENCES

1. Brock and Kay: Archives of Internal Medicine, January, 1921, Vol. xxvii, pp. 1-87.
2. Timme: Archives of Internal Medicine, January, 1917, Vol. xix, p. 79.

DISCUSSION

Dr. C. E. Dowman, Atlanta, Ga.—From the standpoint of diagnosis, surgical neurologists are frequently confronted with the proposition of differentiating between the various types of atrophy, particularly the atrophies that are the result of trauma. Any attempt to classify atrophies is laudable because, when we review the literature, we are confronted with a multiplicity of names based, as a rule, upon the anatomical part involved, which leads to much confusion. The principal point of importance brought out by Dr. Tucker is the differentiation between an organic atrophy and the atrophy of disuse beautifully illustrated in his pictures.

The one test we have to rely upon is the reaction of degeneration. In the progressive cases the reaction of degeneration is apt to be a mixed reaction and this necessitates a careful interpretation of the various responses.

In regard to the treatment of progressive muscular atrophy in children, in the Crippled Children's Hospital in Atlanta we have felt that if the strain upon the muscle groups where the atrophy involves the lower extremities could be relieved by stabilization operations upon the feet, the children could be kept in a fair condition for many years. We have been interested in watching a series of cases where stabilization operations have been done, not with the idea of curing the disease, but to balance the stress and strain, as it were, and avoid undue strain on the involved muscles. We have been gratified with the results.

Dr. Tucker did not touch upon a type of atrophy that I am especially interested in, namely, the atrophy that follows injury to nerves. The atrophy is so extreme in peripheral nerve injury as to necessitate the most careful treatment with massage to prevent an eventual fibrosis in the involved muscles. Should such treatment be neglected the most perfect anastamosis is liable to result in failure, as far as return of function in the affected muscles is concerned.

Dr. Tom A. Williams, Washington, D. C.—With reference to the atrophies due to neurological conditions of which he spoke, we must give the credit to two men, Babinski and Naglotte, for having definitely established the existence of muscular atrophies in tabes as a part of tabes, and due to an infiltration of the anterior spinal roots. It is much commoner than supposed. At some period of life of the tabetic you will find atrophy of that kind which often clears up spontaneously.

We have to remember also with reference to progressive muscular atrophy that Leri twenty years ago studied a large series and found that at least 75 per cent of these cases were syphilitic. They were the subjects of syphilitic radiculitis or of endarteritis of the anterior column of the spinal cord. They were not then true cases of progressive muscular atrophy. My own experience has been that there is no such disease as primary progressive muscular atrophy. The syndrome is due to some cause, which can usually be found. They are either syphilitics or are cases of early syringomyelia, or in a large proportion they are cases of amyotrophic lateral sclerosis in which the upper neuron symptoms are overlooked. I am observing a patient whose case was misdiagnosed progressive muscular atrophy at the Mayo Clinic, and which is definitely and distinctly a case of amyotrophic lateral sclerosis, with marked exaggeration of the reflexes, and not due, as supposed by them, to streptococcic infection.

Then there is also atrophy from overuse. Thus in studying cases supposed to be "traumatic neuritis," one may notice wastage of muscles in the overused parts in people suffering from poor nutrition in whom the atrophy is locally disproportionate to the general wasting. That point in the diagnosis is very important. Dr. Tucker did not emphasize it. The diagnosis of wastage of muscle we must consider, whether the whole man is in a condition of wastage or not. In some cases we must direct our treatment to the general status of the individual. If the atrophy is a local one we should look for the neurological lesion in which the signs are distinct, as in the case of lead and not secondary to primary muscular atrophy which is nearly always, in the first instance, selective in accordance with one of the well known pictures, although there are exceptions. In some of these cases there are distinct differences in the electrical reaction, not in the direction of reaction of degeneration, but in the direction of tonus created by faradism, the number of excitations required to produce tonic contraction in the normal part requiring far more rapid interruption of the current to create a tonic condition.

Dr. M. L. Graves, Galveston, Tex.—Dr. Tucker has given a clarifying discussion of atrophic conditions and their distinction from general emaciation by the fact that they attack the musculature of the body. We are all familiar with such cases as are infectious in origin, or post-infections, and with the luetic form of the disease in which the spirochetes attack the anterior corneal cells and produce focalized atrophy. Occasionally we see cases of atrophy that are progressive in people who have had luetic infection in whom the atrophic condition is not due to the lues but to some other disease.

I have seen two cases of facial hemi-atrophy that were post-typhoid in origin. Certain cases of focal atrophy represent traumatisms occasionally, and sometimes cases in which the atrophy occurs years after a trauma. Some time ago I saw a school teacher who had a stab wound of the median nerve in childhood. It gave her no trouble until after she was an adult, when she began to have paresis and atrophy of the muscles

distal to the injury. Upon operation it was found that the whole median nerve at the bend of the elbow was surrounded by dense adhesions and that ordinary firm fibrous tissue penetrated the nerve and had practically destroyed its function and produced pressure atrophy.

Spinal cord tumors, such as those described by Brown-Sequard, will produce local atrophy in the area of pressure on the side of the lesion, where the sensory disturbance is largely on the other side. Small areas of local atrophy may occur from this.

I have seen cases of atrophy due to syringomyelia. This may originate about the cervical enlargement and cause cavitation, vacuolation and accumulation of fluid with pressure atrophy of the muscles of the shoulder girdle and muscles of the hand. My attention was also directed to the possibility that this could be caused by a cervical rib. Some time ago I saw an Army engineer who had a paretic hand and forearm, with atrophy of some of the muscles. I found that it was due to a cervical rib which had proceeded down to the clavicle, become attached to the clavicle and produced such pressure upon the cervical plexus of the nerves and upon the subclavian artery as to obliterate the radial artery of the hand and produce atrophy of the hand and forearm. The condition was relieved by removal of the cervical rib. After some time the radial artery returned.

The French have called attention to the fact that in many cases of cervical rib there is also syringomyelia and the atrophic conditions are not relieved by removal of the rib. In this particular case, full functional restoration of the arm was produced by the removal of the cervical rib.

A Member.—Has the essayist included in this group for differential diagnosis the lipodystrophia which was discussed yesterday?

Dr. Henry S. Ward, Birmingham, Ala.—Gowers long ago divided the progressive muscular atrophies into two classes: (1) the myelopathies, in which the muscular change is secondary to disease in the motor nerve element; and (2) the dystrophies in which the disease is confined mainly to the muscle itself. In the myelopathies there seems to be an election for the motor nerve element. Chronic poliomyelitis first attacks the anterior horn cells, then invades the pyramidal tracts with exaggerated deep reflexes of the non-affected muscles. Amyotrophic lateral sclerosis early invades the pyramidal tracts and finally the anterio horns cell and often the bulbar nuclei, causing bulbar paralysis. So the three forms of muscular atrophy depending upon lesions of the motor nervous system often blend from one into the other. The dystrophies include the pseudo-muscular hypertrophies and all the familial types of muscular atrophy.

One of the important things in these atrophies is to distinguish between some of the so-called atrophies from disuse, as those connected with arthritis and following trauma. I should never call a case of progressive muscular atrophy a true type that did not have fibrillation and increased reflexes when confined to the shoulder girdle or hand and upper extremities, then the reflexes of the legs are markedly exaggerated. It is very important to differentiate tvpes that are not true progressive muscular atrophy from the true types. Muscular fibrillation and increased reflexes should be looked for, and no patient with progressive muscular atrophy of the genuine type should be taken off of his feet as long as it is possible for him to keep going. If he has an intercurrent disease and becomes bed-ridden, it is practically impossible to get him out again. The same thing holds true with regard to the pseudo-muscular atrophies. It is important to keep them out of bed and using all the muscles they have left. It is remarkable what they can do with a slight amount of muscular tissue. It is surprising what massage and use will do to keep up the nutrition of the muscles and the judicious use of the muscles will often prevent invalidism. Large doses of strychnin may be of value in these cases.

Dr. Tucker (closing).—Dr. Dowman directed attention to the inadequacy and incompetency of the test for the reaction of degeneration. We are far too prone to leave this to assistants who do it carelessly or without understanding it. The partial reactions of degeneration are difficult, especially in dystrophy in the myopathic group, and the nutritional wasting group frequently gives both faradic and galvanic lessening in the electrical test. I thank him also for calling attention to the atrophy following nerve injury. I said that these cases were due to trauma.

I agree entirely with what was said regarding syringomyelia. Of course, I was not picking out the different diseases accompanied by very marked atrophy, usually of the progressive type. I can readily see how overuse may cause muscular wasting, although I have not run across a case of that myself.

I thank Dr. Graves for mentioning spinal tumors and cervical ribs. Atrophy may be connected with both of these conditions.

I did not hear the paper on lipodystrophia. I think when the reflexes are exaggerated and other spastic signs present the condition is usually of the amyotrophic lateral sclerosis type. In a true anterior column defect we get lessened reflexes rather than exaggerated reflexes.

TROPICAL DISEASES AND PUBLIC HEALTH

A PROGRAM OF RURAL HEALTH WORK*

By W. F. Draper, M.D.,
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A program of rural health work which serves to show that, when necessary, health activities may be begun in a simple way and developed and increased gradually is being carried out in Virginia through a cooperative arrangement between the Public Health Service and the State Board of Health.

In the beginning of 1919, only three of the one hundred counties in Virginia were provided with full-time health service of any kind. The remaining ninety-seven had nothing and were showing no signs of unrest because of that fact.

While in every county without exception there were broad-gauge men and women who were eager to secure the benefits of public health work for their communities, the people in general were but little informed on the subject and were more disposed to question the desirability of such measures than to favor their introduction.

As the cities of Virginia are politically distinct and separate from the counties, they pay no county taxes. The county revenues are, therefore, small, being derived in the main from assessed valuations of from $4,000,000 to $8,000,000. Sufficient money to maintain an average county health organization was therefore lacking in most instances and could not be secured without an appreciable increase in the tax rate which would require far more favorable sentiment and active interest than could possibly be aroused.

As the State Health Commissioner was firmly convinced that the carrying out of simple sanitary measures for the prevention of soil pollution and the protection of water supplies would accomplish more toward reducing sickness and protecting the health of the people than would any other single line of work, a program of county health work was developed which possessed three great advantages:

(1) It would accomplish more toward preventing sickness and saving life than would any other single measure practicable.

(2) It was within the available resources of the county and the State Board of Health.

(3) It would serve as the foundation for an efficient well balanced county health department, which might be developed gradually as general recognition of the benefits of the work already done was secured.

The initial appropriation to be provided by the counties was $1500. The State Board of Health contributed $700 and the Public Health Service $300. The total of the annual budget was therefore $2500. State and Service funds were sufficient to supplement local appropriations in 12 counties and this number was undertaken as a demonstration of the plan. For the purposes of the demonstration, the Public Health Service assigned a medical officer to take general charge of the work and two sanitarians who were not physicians each to have immediate supervision of six counties.

The actual details of the work in each county were carried out by a man whose prerequisites were a vigorous body and sound common sense and who had received his training in the field from officers of the Service and the State Board of Health. He was known as the County Sanitary Officer. The ground which he covered may perhaps be shown best by quoting a page from a county fair prospectus which reads as follows:

THE SERVICES OF THE COUNTY SANITARY OFFICER ARE FREE TO ALL CITIZENS OF THE COUNTY. HE IS HERE TO HELP YOU.

Some of the things he will do for you if you ask him:

Have your drinking water analyzed to see if it is pure.

Show you how to protect your well against pollution and how to make it safe.

*Read in Section on Public Health, Southern Medical Association, Sixteenth Annual Meeting, Chattanooga, Tenn., Nov. 13-16, 1922.

Show you how to make the spring safe by protecting it from surface contamination.

Help you select the type of sanitary privy best suited to your conditions and show you how to build it.

He will show you how:

To build a septic tank to care for sewage from the home, school, or factory and where to locate it.

To construct a septic privy.

To make a home-made fly trap.

To screen the home to keep out both flies and mosquitoes.

To prevent both fly and mosquito breeding.

To get rid of rats by trapping or poisoning.

Kind of bait to use and how to mix it.

In general, he will do anything that will help to keep the citizens of this county well and healthy.

County Boards of Supervisors are furnished with monthly reports of the work. At the end of the year, when renewals of the appropriations are under consideration, it can usually be shown that on a few items alone, entirely exclusive of the great bulk of the work, the sanitary officer has saved to the citizens several times the amount of his cost. As this is a matter of considerable importance from the standpoint of securing appropriations, a few examples may be cited:

CARROLL COUNTY

In previous years the county had expended from $600 to $2000 for the treatment and control of smallpox alone. During the current year the total expenditure for this purpose has been less than $50. In running down cases, quarantining, and vaccinating, the Sanitary Officer traveled more than 1250 miles on horseback during the winter months. One hundred and sixty-five persons were vaccinated and 185 quarantines were established. In addition to this, the installation of more than 2000 sanitary privies was secured in a rugged mountainous county where less than 10 per cent of the houses were provided with closets of any kind before.

Although no health official was present when the Board met to fix its budget for the following year, it was stated that the Sanitary Officer had secured in one year as many sanitary improvements as would have been thought possible in five and that his smallpox work had more than saved his salary. The Board provided for the continuation of the Sanitary Officer by unanimous consent.

CHARLOTTE COUNTY

The Sanitary Officer secured the cooperation of the local physicians in an anti-typhoid vaccination campaign. Each doctor set aside certain days for giving the inoculations free of charge. Through cooperating agencies the vaccine also was furnished free of charge. The saving to the people of Charlotte County, based on the lowest cost of materials and charge for physicians' services, is as follows:

3068 doses of antityphoid vaccine at 7 cents each	$ 214.76
3068 inoculations at 50 cents each	1534.00
Total	$1748.76
Annual cost to County of Sanitary Officer	1500.00
Net profit to citizens of County on anti-typhoid item alone	248.76

The Board of Supervisors was unanimous in voting for the continuance of the Sanitary Officer and appropriating the money.

CHESTERFIELD COUNTY

Saving to 286 citizens through antityphoid vaccinations	489.00
Saving to parents of 469 school children through smallpox vaccinations	469.00
Saving to taxpayers through prompt action in preventing rabies epidemic	2700.00
Saving to taxpayers through assistance given in construction of school toilets	2000.00
Saving to citizens through securing 1370 yards of drainage ditching from outside sources	425.00
Total	$6083.00
Annual cost of Sanitary Officer to County	1500.00
Net saving to County on above items alone, which were incidental to the main bulk of the work	$4583.00

This program has been continued for upward of three years with generally satisfactory results. It is now the intention of the State Health Commissioner to recommend to the next General Assembly that a sufficient appropriation be made to assist in establishing a sanitary officer in a much larger number of counties, and eventually in every county in the State which has not been provided with a full-time health unit.

Reference has been made to the practicability of utilizing such a plan for the gradual growth and development of a county health organization. In this connection it may be interesting to note that six of the twelve demonstration counties have already passed from what may be called the first stage of health work to the second stage, where, instead of having only a sanitary officer or a public health nurse, they now have both a sanitary officer and public health nurse working as a county health unit to give to their counties the most effective health administration possible with the resources at their command.

Where such a combination exists the demonstration is showing that under the medical supervision of the Public Health

Service and the State Board of Health various agencies and facilities may be utilized to render to these counties fairly adequate health service. The health activities which can be carried out by a capable sanitary officer and nurse by securing the active cooperation of various useful agencies and skilfully organizing them may be outlined as follows:

(1) *Control of Communicable Diseases*

A. Diagnosis, reporting, isolation, treatment, by county board of health and local physicians.

B. Quarantine, by sanitary officer in cooperation with county board of health and local physicians.

C. Investigation and control of outbreaks and epidemics, by medical officers of the U.S.P.H.S. and state board of health.

D. Public health nursing by county nurse.

E. Smallpox investigations, vaccinations, quarantine, by county board of health and local physicians, assisted by sanitary officer; sanitary officer and nurse both vaccinate when qualified and authorized to do so by supervising agencies and county board of health.

F. Anti-typhoid inoculation campaigns, by local physicians with assistance of sanitary officer and nurse.

G. Cleansing and disinfection, by sanitary officer.

(2) *Child Welfare*

A. Physical inspections of school children, by school teachers under direction of state board of health and state department of public instruction, and under supervision of county nurse.

B. Follow-up work by county nurse.

C. Correction of physical defects by family physicians and by clinics organized by county nurse in cooperation with county board of health and local physicians.

D. Clinics. (1) Tonsil and adenoid, organized by nurse. Operations done by specialists chosen by local physicians.

(2) Eye, organized by nurse. Treatment prescribed by specialists chosen by local physicians.

(3) Orthopedic, organized by nurse. Treatment and operations done by orthopedist in charge of orthopedic wards of state board of health.

(4) Tuberculosis, organized by nurse. Sanitary officer may assist. Examinations made by specialists of state board of health. Follow-up work by county nurse.

(5) Dental, organized by nurse, or sanitary officer, or both. Dental work done by local or state board of health dentists under direction of state board of health dentist in charge of mouth hygiene.

E. Maternity and pre-natal work, by local physicians and county nurse.

(3) *Sanitary Inspections*

A. Privy construction, by sanitary officer.

B. Individual water supplies, by sanitary officer.

C. Foods and food establishments, by sanitary officer.

D. Camps, villages, mines, by sanitary officer.

E. Malaria, controlled by sanitary officer with supervision and assistance of the United States Public Health Service malaria control specialist.

(4) *Laboratory*

All public health laboratory work is done free at laboratory of state board of health.

(5) *Public Health Education*

A. The state board of health portable motion picture outfit and health films are assigned to each county and accompanied by the supervising officer, sanitary officer, and nurse for each county. About thirty shows are given in all sections of the county. The average attendance in each county is 5000.

B. Lectures by United States Public Health Service and state board of health officials.

C. Public talks by sanitary officers and nurses.

D. Organization of junior health leagues in the school by county nurse or sanitary officer.

E. Individual educational work by house-to-house surveys.

F. County fair exhibits conducted by United States Public Health Service, state board of health, sanitary officers and county nurses.

G. Health articles in local newspapers.

H. Publications, signs, placards, circular letters, etc., all agencies.

DISCUSSION

Dr. Ennion G. Williams, State Health Commissioner, Richmond, Va.—We in Virginia consider that we are exceedingly fortunate in having this program carried out by Dr. Draper. What he has told you is not a theoretical program, but one which has been in actual practice for several years.

Dr. A. P. Harrison, State Board of Health, Austin, Tex.—If we have ample funds it simplifies the organization and carrying out of any work to a marked extent, but we have had explained to us this morning that such a task can be successfully carried on with small funds where the organization is very difficult. Dr. Draper has told us that he had only two sanitary men: one doctor in charge of his plan of work, with two sanitary men and other assistants working over a territory comprising twelve counties. It is usually a very difficult process to carry on work successfully in one county where you have a doctor at the head of the work and one or two sanitary inspectors, and possibly a nurse or two. So these men have accomplished a task which, on the face of it, would appear almost an impossibility. We should all be interested in some further details in regard to it. The work, I understand, has been going on for about three years now.

I should like to ask Dr. Draper how many of these twelve counties have been able to provide themselves with a whole-time county health officer, who gives his entire time to the work of that county. I should also like to ask him to give us some details as to the saving of money in the campaign against rabies, and the saving of money in the building of school toilets.

He has mentioned practically all the activities that should be carried on by a county health de-

partment, with possibly one exception, the life extension feature of the work, which has been found very profitable and has come into considerable favor with the people in certain localities. That is where the doctor who has charge of the unit offers to the public the privilege of being examined, of making an appointment and coming to his office and receiving a careful examination, to take stock of his physical condition. Often incipient troubles, cancer, for instance, have been discovered in the early stages when they were still curable and lives have been saved. Work of that kind appeals very much to the people, and if you are fortunate enough to diagnose an early case of a serious trouble there is probably nothing that will make the work of the county health department more popular with the people than this feature of life extension examinations.

Dr. James A. Hayne, State Health Officer, Columbia, S. C.—One objection I have to the plan as outlined by Dr. Draper is this: I have tried to induce medical men to take up, as a career, public health work, and have laid stress upon the fact that an M.D. degree is necessary for the proper carrying out of public health work; that in order for a public health official to be respected in a community and to take his place in the community, his opinion on diseases must be respected by the people of that community. He must be a man whom the medical men of that community look up to as an authority. I cannot understand how the ubiquitous sanitary man travels over six counties, and how he gets his salary and that of the nurse out of $2500. Does he work for $1000 or $1500, or does he work for nothing? We find in South Carolina that it is rather difficult to get over a small county, with 15,000 inhabitants, with a doctor, two sanitary inspectors, and several nurses. I do not see how Virginia can so differ from South Carolina that in Virginia one doctor can cover twelve counties, while in South Carolina he cannot make himself felt over one entire county.

Dr. W. S. Keister, Charlottesville, Va.—A few years ago, when we hookworm people went through the counties, we spent just a few weeks trying to induce the people to get rid of hookworm disease. The program unfolded a little further, and it was decided not only to cure hookworms but to prevent them by putting in sanitary toilets. We were called detectives, privy-builders, and everything else. I believe that the title of privy-builder is one of the most honorable a man can have, for the privy-builders have saved more lives in the South than any one else.

We started on an intensive campaign in three or four counties, setting an example of what sanitation meant by building privies and getting rid of hookworms. The big thing in that was not so much in building the privies, but promoting the public health conscience. Some of us doubted whether that work was worth much, for we knew that when the sanitary officer left the county many of the people would return to their original conditions. In spite of that, many of these counties have put in sanitary inspectors at $1500 a year. Some of them have added a nurse and a few have put in whole-time county health departments.

Looking through a keyhole, we could see a small perspective: the establishment of local health units which would take part of the burden from the State Health Department. We started with the medical inspection of schools, the most spectacular part of public health work, but not the most important. (I feel that sanitation is the most important thing.) That was started in 1914, in Albemarle County. A few spasmodic efforts had been carried out in that county at different intervals. Later, in 1920, it was thought wise to develop a whole-time health department. It was started with a nurse, who preceded the health officer by about six months. Later an office assistant was added, then two nurses, then a sanitary inspector, and later a dentist. Finally we had an organization of eight or ten people. Starting from a small beginning, we have continued this work over several years. The first year the County appropriated $1000 out of $10,000; the second year $2500 out of $10,000; then $7500 out of the $10,000. This year we have been fortunate enough to have a joint health department started by the city of Charlottesville, the county of Albemarle, and the State University, where we hope to put in a public health course.

This is a business, and if we intend to do it properly we must have men who are trained for the work, and we have made it a point to put in new men until we are prepared to give the people the best it is possible to give.

Dr. S. W. Welch, State Health Officer, Montgomery, Ala.—The success of any large undertaking depends upon the ability of the executive to recognize his problem, and his resourcefulness in devising means to meet it. It seems to me that the program which has been adopted in Virginia shows, first, a clear recognition of the problems involved, and, second, a degree of resourcefulness in devising means to meet those problems which is more or less unusual. With a taxable valuation of $8,000,000, to be able to devise a plan that would meet a serious public health problem in an entirely different manner from that which is being used in other states, calls for congratulations from all of us to the directing head of the organization.

In the majority of the newer states a different political unit exists. In my own State the county is the unit. The county elects the health officer and he is the *ex officio* health officer of each municipality in the county. The appropriations from the cities and county are budgeted, and he is the directing head of all the public health activities in the county. In Virginia they have devised a way of meeting a difficult problem by putting non-professional men in charge of the work, which would not be possible in the State of South Carolina. It is more or less fortunate that things can be done in ways other than they are done in South Carolina. If it were not, I do not know what would become of the rest of us. However, I would not say that things are not done in a fairly competent and efficient manner in some parts of South Carolina.

The plan developed in Virginia is worthy of serious consideration by all of us, because in every state there are counties that have not a

very large revenue. We have adopted this plan of doing public health work in Alabama, and it has worked excellently. The Virginia plan has been adopted *in toto*, and, under the direction of Dr. Sharpe, district health officer, a sanitary inspector has been placed in charge of all of the non-medical work. There are certain phases of public health work that cannot be done by any one other than a doctor, but there are a large number of activities that can be done by non-professional people under a doctor who has charge of a number of counties, and that is the plan, as I understand it, that has been worked out in Virginia. It seems to me to be a valuable addition to our public health knowledge.

Dr. John A. Ferrell, International Health Board, New York, N. Y.—As a comparatively small appropriation is required to finance Dr. Draper's working unit, his plan is particularly valuable in providing a health service for those counties having a small population and little wealth. Practically every state has at least a few such counties and the state boards of health have encountered real economic difficulties in supplying them with an adequate health service. If Dr. Draper has developed the best type of health service economically feasible for such counties, he has made a real contribution.

For counties approaching or exceeding the average in wealth and population I should advocate a larger unit of working force directed by a medical health officer. It would cost from $8000 to $12,000 yearly, and in addition to the medical director it would consist of an office assistant, one or more public health nurses, and possibly a sanitary inspector. The medical director should have a strong and pleasing personality, sound judgment, tact, enthusiasm and other qualities essential to leadership. Unless he possesses these qualities he will not justify his salary nor inspire enthusiasm among his associates or those who are to be served, and his accomplishments will not compare favorably with those obtained by an efficient public health nurse or sanitary inspector. There is encountered some difficulty in finding, interesting and training the type of physician who can successfully direct the well rounded county health organization, but the task is not impossible; for at least one hundred directors are already engaged in the work and are making the county health organization a real factor in the field of public health.

It might be well to have as our goal the larger health unit directed by a physician for counties of average or greater resources and the unit described by Dr. Draper for the weaker counties. Time and experience will, of course, permit many improvements in both types of county health units and enable the health authorities to supply the counties weaker than the average with the best health service their financial resources will permit.

I doubt the advisability of sending a public health nurse or a sanitary inspector into a county well above the average in financial resources with instructions to work along certain clearly defined lines with a view to demonstrating that a larger health unit should be developed in such way as to subordinate or eliminate herself or himself. Deliberate self-elimination or self-subordination is not generally expected of an employee. If this worker is assured of his position with the state board of health, and if he understands that when his task of eliminating himself from a county organization is completed, another similar task, or a promotion awaits him, then he might be expected to have the needed incentive to make the plan workable.

Regardless of the type of health organization adopted by the counties, there should be no difference of opinion as to the desirability of obtaining the best qualified staff members available. Their training, practical and scientific, should be as thorough as it is possible to make it. The development of facilities for supplying this training to present and prospective health workers is another important task to which the health authorities are beginning to direct their attention, but its discussion at this time is hardly in order, except to say that it will become increasingly urgent as the development of county health work is extended.

Dr. Draper's work in Virginia was most valuable. He has made a contribution to public health administration which merits our appreciation.

Dr. Draper (closing).—Two counties which we started with a sanitary officer later made appropriation for a whole-time health officer. In one of these counties the State representative went before the Board of Commissioners and told them that if a sanitary officer could do so much work, much more could be done by a health department with a medical health officer. The Board appropriated $5000 and the following year, instead of having a sanitary officer, we had an experienced medical health officer and a complete health unit, and did a splendid piece of work. At the end of the year the people did not appreciate the value of the work and did not appreciate the medical school inspection, but wanted the one man back, so they reverted to the sanitary officer. They could appreciate the small beginning, but not enough people understood the value of the larger work to support it.

The second county, after one year, we also succeeded in getting to put up $5000, and we had $5000 from outside sources. We waited eight months to get the right kind of man. At the end of that time they became tired of waiting, rescinded their action, and used the money for something else. They have, however, a county health nurse.

Six of the counties now have a nurse in addition to the sanitary officer.

I said that $2700 had been saved to the county by the prevention of an epidemic of rabies. One day a dog went mad, traveled in a circle, and bit nine dogs, a hog, and four people. The sanitary officer followed and killed the dogs. The people who were bitten were treated at the rate of $75 apiece, which had to be paid for by the county supervisors. We explained to the board of county supervisors what the cost would have been if the nine dogs had gone mad and had each bitten four people.

There is a sanitary officer in each county, so he is not so very ubiquitous. The supervising officer is not in charge of the county at all, but in charge of the administrative work. The sanitary officer receives a salary of from $1500 to $1800. The difference between that and the $2500 goes into his automobile and transportation. When the nurse is added that costs $2500 more, and they have a $5000 budget instead of a $2500 budget.

There is just one thing I wish to say about public health work as a vocation. It is a good thing to advise physicians, especially young physicians, that there is a splendid career in health work. But in the type of counties where we have been working the physician is not yet the man to do that work. I am a physician, and I have been in those counties. I heard of some of the reports that went to the board of supervisors, that the idea that typhoid was carried by flies and malaria by mosquitoes was simply ridiculous, and merely a scheme to cook up a high priced job for some one who would come in and drive over the county in an automobile. In starting this work, instead of having sanitarians for supervising officers, I had two doctors who were extremely well qualified for the work and who had had excellent results in other fields, and these two doctors did not begin to get the results which my two non-medical sanitarians are getting now. They could not get and maintain the results because their training was not of the kind that led them to get out in the field and with their own hands show people how to dig pits, build forms for sanitary concrete construction work, repair well platforms, and do the countless other homely jobs that people want done and have to be shown how to do. In such work a sanitary inspector is needed, not a doctor. Medical direction is of course necessary and it is the province of the state board of health to determine the policy to be followed in county work and shape its course.

TEN MINUTES WITH VITAL STATISTICS*

By J. H. Florence, M.D.,
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Those states that have succeeded in meeting the requirements of the Federal Government and have been admitted into the Federal registration area receive many benefits not enjoyed by those outside of this area. It has been the experience of most health officers in their efforts to meet the Federal requirements that they educate the public, undertakers and funeral directors and medical profession alike. With reference to my own State, we are greatly handicapped because of statutory limitations. Statutes creating the Bureau of Vital Statistics were enacted in 1910, and our present degree of efficiency, based upon Federal requirements, is 60 per cent deaths and 75 per cent births. Admission into the birth area during the next twelve months is anticipated, provided the proper legislation can be secured at the next meeting of our Legislature.

The Bureau of Communicable Diseases and that of Vital Statistics are the clearing houses of health conservation activities. Morbidity and mortality reports must be properly tabulated and interpreted to be of any material value.

Approximately 3000 deaths are reported monthly to the Texas State Board of Health. Of this number 16 per cent, or one out of every six, is an infant less than one year of age. The number of white infants less than one year of age who die during the first year is three times as great during the first seven days as the succeeding three weeks.

A closer study of this mortality reveals surprising results relative to color experience.

The population of Texas is 4,663,000, being 76 per cent white, 16 per cent negro and 5 per cent Mexican. Using 100,000 as a radix, infant mortality experience is white 37, negro 34.5 and Mexican 256. In other words, the Mexican infant mortality is not an obscure factor in the production of high infant mortality.

These facts allow the following interpretation:

Prenatal development of the fetus during the latter months of gestation results in immature infants of low vitality and the child dies of inanition. This scientific fact is a reliable monitor to the physicians whose duty it is to advise properly the expectant mother through this period. A common interpretation of this high infant mortality is that of syphilitic history. It is true when history can be established by a positive blood examination the deduction is logical and true. Too often this statement is used as a camouflage for superficial knowledge, absence of proper instructions as to hygiene, exercise and the proper

*Read by title in Section on Public Health, Southern Medical Association, Sixteenth Annual Meeting, Chattanooga, Tenn., Nov. 13-16, 1922.

diet, or indifference and non-observance on the part of the mother. The prevailing cause of the mortality following the first seven days of life and prior to the second month is due to artificial feeding.

Contrary to the general supposition, mortality of colored infants is remarkably low under one month, while that of the succeeding months closely follows that of the white experience.

Mexican mortality exceeds that of the negro. This increases during the whole year period, the principal cause of death being inanition, malnutrition and enteritis, direct results of improper feeding, diet, hygiene and sanitation.

Modern methods in the treatment of tuberculosis have operated in no small degree in the reduction of adult mortality.

According to the Federal report of 1920, the average tuberculosis mortality was 114 per 100,000 population. The individual state's experience varies from 39 to 175. The non-resident patients often operate as a modifying factor in a state's normal experience. The present statistical mortality efficiency is 67 per cent.

Texas tuberculous mortality experience during the six months just past is 7.8 plus of deaths from all causes, or 0.9 per cent less than the Federal experience. Using the Farmingham method of calculation, it is fair to assume there are living today 46,000 persons afflicted with tuberculosis.

Like many other Gulf states, Texas experiences a heavy malaria mortality. Particularly is this true in the southeastern, northern and east-central sections. Malaria as the immediate cause of death during recent years has been 20 per 100,000 population for the entire State. Mortality in the malaria area is at least 50 per cent greater.

During the months of August, September and October of the present year there has been an extensive epidemic of dengue in the malarial area. Although it is a reportable disease, its extent can only be surmised, since the statute has been indifferently complied with. The present month reports 65 deaths. If there were 100 per cent efficiency in reporting this would be approximately 100 deaths.

I am indebted to Dr. J. C. Twitchell, State Statistician, for the data used in this paper.

SURGERY

RAILWAY, INDUSTRIAL, GYNECOLOGICAL, OBSTETRICAL AND UROLOGICAL

EXPERIMENTAL INTRAPERITONEAL DIVISION OF ONE URETER*

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Accidental injury to the ureter is one of the two greatest dangers to which a patient is subjected during intrapelvic operations. (The other danger is hemorrhage.) The most frequent involvement of the ureter is complete obstruction produced usually by ligation, sometimes by clamping or kinking. Next in frequency is incision, either partial or complete; then resection of a portion, and finally destruction of its blood supply, leading to necrosis. In a former article[5] sudden complete ureteral obstruction was taken up in detail. It is the purpose of this paper to consider similarly the effects of complete intraperitoneal division of one ureter.

REVIEW OF THE LITERATURE

The literature on this subject is not large as compared with that on ureteral ligation. In Table I is given a summary of various researches.

Number and Kind of Animals.—The number of animals used by most of the investigators was too small to justify the induction of final conclusions. Also it would seem, according to Barney's[1] results, that one must employ both carnivora and herbivora in order not to be misled.

Technic.—The transperitoneal route naturally was the one employed almost exclusively. As to details concerning methods, Willgerodt[11] and Barney[1] are the only ones who describe them adequately. The former tried to maintain long-continued absorption of urine from the peritoneum by simply severing the ureter and fastening it to the bladder wall within the peritoneal cavity; but the firm adhesions which were formed rapidly closed up the cut end in all of the first five dogs upon which he did this operation. So in order to avoid this obstruction of the ureter, he tried the expedient of excising a portion of the bladder wall, including the ureteral opening. The hole in the bladder was then closed and the resected ureteral stoma with its adjacent portion of bladder wall was allowed to lie free in the abdominal cavity. This dog died in twelve days. A diffuse purulent peritonitis was found and also a large retroperitoneal abscess into which the ureter opened. The bladder wound had healed perfectly.

In the next dog he did a precisely similar operation with the added feature of inserting into the ureteral opening a piece of rubber tubing about 10 cm. long, the free end of which was placed between coils of intestine. This dog died 8 days later. The autopsy showed between the intestinal folds an abscess, which was thoroughly walled off and in which lay the tube. The peritoneum was entirely normal. Again he repeated this experiment, using this time a tube of ivory. After 8 days he killed the animal and found the end of the tube plugged with actively proliferating granulations. The peritoneum glistened, although it contained 40 c. c. of yellowish reddish fluid. In still another dog he used a silver tube, and at the end of 4 days found that it opened into an interintestinal encapsulated abscess. This last experiment, repeated in every detail in another dog, showed on the seventh day the tube sealed by adhesions of omentum and gut. The ureter and kidney were filled with pus.

Mortality and Morbidity.—The length of time the animal lives after operation, and especially the fact whether it lives on indefinitely and in a healthy condition, are points of the greatest significance in the application of these experiments clinically. In Table I, I have ascertained 61 per cent

*Read in Section on Urology, Southern Medical Association, Sixteenth Annual Meeting, Chattanooga, Tenn., Nov. 13-16, 1922.

as the approximate average mortality, giving each investigator an equal percentage rating. This obviously is unfair, as probably more than half of all of the animals reported in the entire table were operated upon by Willgerodt[11] and Barney;[1] and the mortality with these two men was only 33 and 36 per cent, respectively. Accordingly, giving the work of these two experimenters its proper weight, the mortality would be reduced to about 40 per cent. Also, considering only those writers who stated the number of animals used (this includes Willgerodt and Barney), the mortality is 35 per cent. On the other hand, there is no reasonable doubt that if some of the animals which were killed during the first or the second week had been allowed to live longer, they would have died spontaneously, thus increasing the mortality. So, on account of this factor, 10 or 15 per cent may safely be added to the estimated 35 or 40 per cent just mentioned, making finally 50 per cent as the approximate mortality. Still further criticism must be made, namely: if Barney had used twice as many carnivora as herbivora (he employed 14 carnivora and 26 herbivora) his mortality would have been twice as large, thus increasing materially the 50 per cent mentioned above. Thus it will be seen that an accurate statement as to what the true mortality is in the researches to date in this field is at least very difficult, if not impossible.

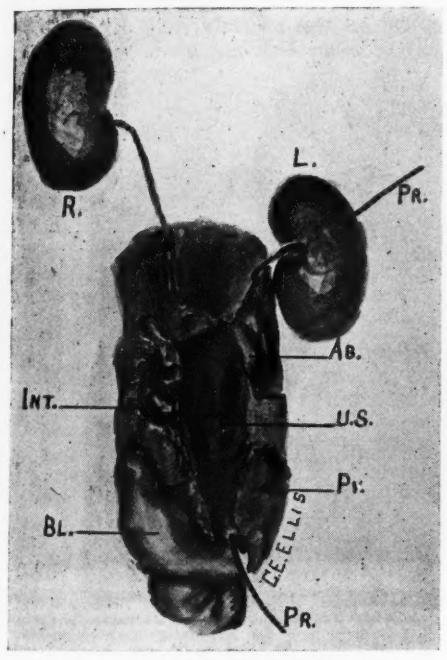

Fig. 1.—Specimen from a rabbit which died 54 hours after complete division of the left ureter near the bladder. The chief feature is the urinary sac (U. S.) formed by the bladder (Bl.), intestines and omentum (Int.), pelvic wall (Pv.), and abdominal wall (Ab.). These structures are pulled aside to show the interior of the urinary cavity. A probe (Pr.) was passed on the operated side through the kidney and the ureter; the point of emergence near the bottom marks the location where the ureter empties into the newly formed urinary space. R., right kidney. L., left kidney. Compare Fig. 2.

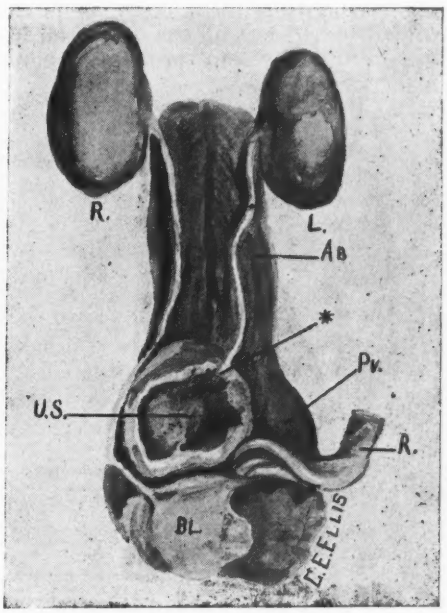

Fig. 2.—Slightly diagrammatic drawing from a rabbit 11 days after complete division of the right ureter near the bladder. The most important point is the newly formed urinary sac (U. S.). Only the dorsal portion is shown; the ventral part was composed of adherent intestines and omentum which have been torn away, and bladder and rectum which have been retracted. *, point of entrance of divided ureter into this sac. R., rectum. Other abbreviations the same as in Fig. 1. Compare Fig. 1.

The cause of death in Barney's[1] carnivora (his herbivora did not die spontaneously) "was primarily sepsis, but certainly uremia played its part." The other investigators agree pretty well with Barney, except that perhaps they have a tendency

to assign greater importance to uremia. It is of interest to note in this connection that nearly every one who never has heard of these experiments or who has done them before consulting the literature, has been surprised that the mortality is not 100 per cent, and wonders why the animals do not all die promptly instead of living on indefinitely, as is the case with many of them.

The morbidity in these experiments varied greatly and was all the way from illness severe enough to produce prompt death to complete absence of any signs of sickness. Symptoms are described by only three investigators, Willgerodt,[11] Sampson[8] and Barney.[1] Excluding Sampson, whose experiments included but two animals, the symptoms described by the other two agree very well: first vomiting, then diarrhea; later coma and convulsions. (These symptoms are common also in the human.) Distinct signs of illness are reported in probably less than half of the animals included in Table I. The earliest and most frequently noted symptom was vomiting, which, when it occurred, was confined mostly to the first two days. Diarrhea was of nearly equal frequency; it usually followed the vomiting and lasted much longer, sometimes a week or more. During the second week, convulsions and coma were not infrequent, especially in the fatal cases. A rise in temperature or an increase in the rate of the pulse or of the respiration were rarely noted, not necessarily because these signs were not present but rather because the observations were not taken. Least frequently of all were symptoms of bladder irritation mentioned. Most of the symptoms occurring in these experiments, especially vomiting, diarrhea, convulsions, and coma, were supposed usually to be toxic in origin on account of the absorption of urine. Infection no doubt played a role; and the proximity of the bladder and the rectum to the prime source of trouble would explain in part at least the irritation of these organs.

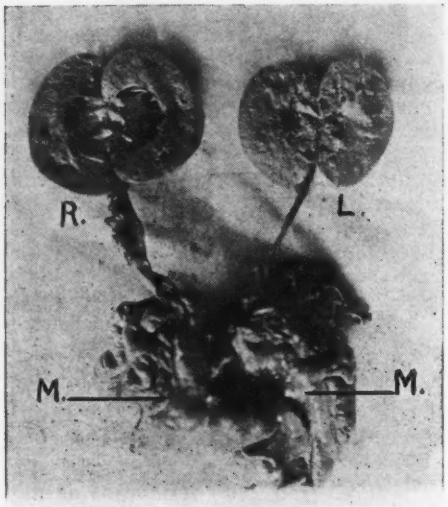

Fig. 3.—Kidneys, ureters and bladder with adherent adjacent tissues from a dog 20 days after complete division of the right ureter near the bladder. R., right kidney. L., left kidney. M., mass of adherent structures including bladder and portions of omentum, intestines and pelvic wall, surrounding the point where the ureter was severed and occluding the opening securely. Note on the operated side the dilatation of the kidney pelvis and the enlargement of the ureter. The latter was much more noticeable in the fresh specimen before the contents escaped. Compare Fig. 4.

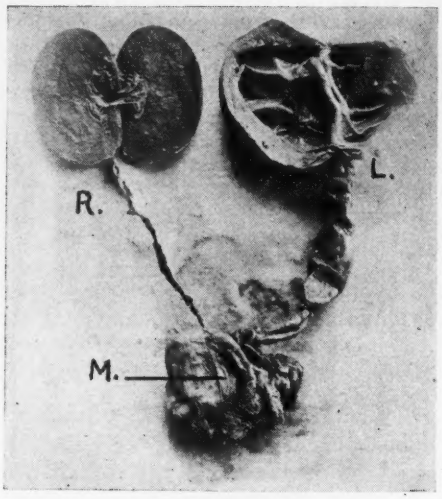

Fig. 4.—Kidneys, ureters and bladder with adherent adjacent structures from a dog 42 days after complete division of the left ureter near the bladder. Abbreviations the same as in Fig. 3. Note the marked cystic condition of the kidney and the extreme dilatation of the ureter on the operated side. Compare Fig. 3.

Changes at the Point of Ureteral Division and Involvement of the Peritoneum and Retroperitoneal Tissues.—In by far the great majority of instances local adhe-

sions prevented wide diffusion of urine. Straus[9] is the only investigator who has not found this to be the case. In some instances, the reaction is so prompt and vigorous that but little urine escapes. Barney[1] found that the "divided end (of the ureter) became occluded (1) by direct adhesions to gut or omentum; (2) by blood clot in its lumen, often extending almost up to the kidney; and (3) by organization

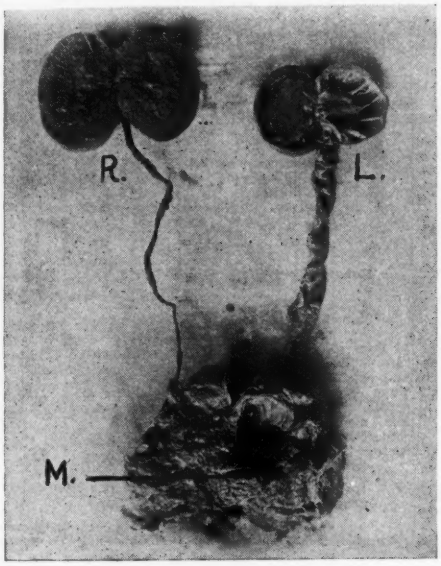

Fig. 5.—Kidneys, ureters and bladder with adherent adjacent structures from a rabbit 264 days after complete division of the left ureter near the bladder. Abbreviations the same as in Fig. 3. Note especially the small size of the kidney on the operated side. This general atrophy developed in spite of the fact that the organ became markedly cystic. It was filled with a soft solid material which has been left *in situ* on one side of the kidney but removed on the opposite side to show the cystic state. This condition of the kidney, together with the marked dilatation of the ureter, demonstrate the atrophy to be secondary, that is, following primary cystic enlargement. Compare Fig. 6.

of exudate, seen only in late cases. Often no special cause could be demonstrated."

DeQuervain[2] says that "wounds of the ureter have a great tendency to become harmless through cicatrization. Only in cases where * * * this proliferation does not occur the condition goes on to peritonitis."

Sampson[8] considers that the walling-off process is so constant that the ultimate result of complete severance of the ureter usually is the same as that of ligation. The dykes around the breach in the ureter are formed by the omentum, intestines, bladder and pelvic and abdominal walls, one or more of these structures always being involved.

In the animal of Willgerodt's[11] which developed diffuse peritonitis, he divided a second time the dilated ureter which he had severed completely three weeks previously. The second incision was cephalad

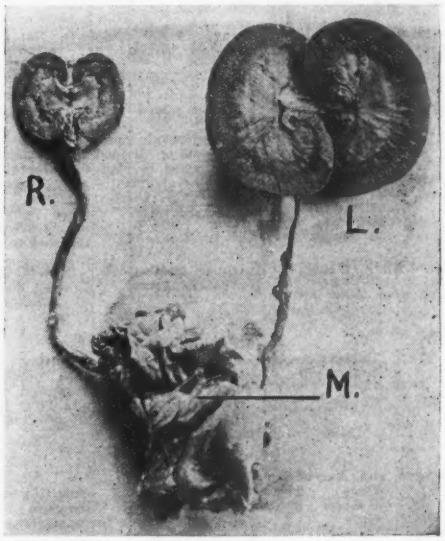

Fig. 6.—Kidneys, ureters and bladder with adherent adjacent tissues from a dog 301 days after complete division of the right ureter near the bladder. Abbreviations the same as in Fig. 3. Note that the ureter on the operated side exhibits comparatively little enlargement, that the kidney is exceedingly small and that it has suffered but little cystic transformation. These features mark this renal atrophy as being primary, that is, occurring with but little previous enlargement. Compare Fig. 5.

to the first and let loose into the free peritoneal cavity a fluid which showed microscopically "pus detritus." Under these circumstances, diffuse suppuration would be practically inevitable.

In regard to the pathogenesis of free fluid in the peritoneal cavity, the following statement by Barney[1] describes the process the most accurately:

"* * * in spite of the great power of absorption possessed by the peritoneum, it cannot keep pace with the great effusion occurring soon after the peritoneal insult. Hence the free fluid is seen in early cases. The absence of fluid in later cases may be explained by the fact that the effusion of urine and serum has stopped and that already

TABLE I—SUMMARY OF

Experimenter and Date	Animals and Number	Technic	Symptoms	MORTALITY AND AGE OF SPECIMEN			
				Died Spontaneously (Mortality)	Time	Killed	Time
Israel, O., 1881	4 dogs	Extraperitoneal route Divided ureter near renal pelvis and diverted all of urine on one side into free peritoneal cavity. Wound closed in layers	Not stated	4	4 to 5 weeks	None	.....
Strauss, M. I., 1890	Dogs and guinea pigs. Number not stated	Intraperitoneal route No details given	Not stated	Guinea pigs Dogs	About 2 days and 5 to 8 days	None	.....
Tuffier, M., 1890	Rabbits Number not stated	Not stated	Not given	All	8 to 10 days	None	.....
Willgerodt, H., 1897	11 dogs	Intraperitoneal route Renal end of divided ureter sewed to bladder wall intraperitoneally. For further details, see text.	Vomiting first two days; then diarrhea for several days; finally coma and convulsions. Some of these symptoms in nearly every dog. Attributed to uremia	4 (?)	8 to 12 days	7 (?)	8 to 21 days
Sampson, J.A., 1904	2 dogs	Intraperitoneal route No details given	"Convalescence of both dogs most uneventful"	None	.....	2	3 to 4 weeks
Barney, J. D., 1910	Rabbits 25 Guinea pig 1 Dogs 11 Cats 3 Total 40	Intraperitoneal route Ureter "* * * ligated with No. 0 chromic catgut at about the pelvic brim, and divided on the proximal side of the ligature"	Vomiting and diarrhea "occasionally" in dogs and cats. Rabbits "but little if at all affected"	14 dogs and cats. "Dogs and cats always die of sepsis." Uremia, also, a contributing factor	4 to 11 days	25 rabbits "Rabbits always recovered"	1 to 7 (?) days
Summaries and Averages							
Six investigators 1881-1910	Dogs 28+ Rabbits 25+ Cats 3 Guinea pigs 1 Total 57+	Too miscellaneous to be summarized	Vomiting early; then diarrhea; coma and convulsions later. Symptoms attributed mostly to uremia, tho infection played a part	About 61%	Two days to 5 weeks	About 39%	One day to 4 weeks

TABLE II—SUMMARY OF

Number and Kind of Animals	Age of Specimens	Died Spontaneously	Killed	General Condition	Site of Ureteral Division	Peritoneum
18 Rabbits	20 hours to 264 days	14 animals 78% mortality	4 animals 22% recoveries	Excellent, 4; good, 2; poor, 10; no record, 2. Chief symptoms, quietude anorexia, weakness and diarrhea.	Adhesions in all; delicate in younger, firmer in older specimens. Urinary sac formed by adhesions of bladder, intestine and abdomino-pelvic wall, 11. Mild adhesions, no sac, 3. Dense adhesions, no sac, 3. No record, 1.	Normal, 14 Slight or moderate peritonitis, 4
6 Guinea pigs	1½ to 15 days	6 animals 100% mortality	No animals No Recoveries	Excellent until a few hrs. before death, 4. Sick all of time, 2. Symptoms about same as in rabbits	Adhesions in all; delicate in younger, firmer in older specimens. Urinary sac formed as in rabbits, 4. Firm adhesions, no sac, 2.	Normal, 5. Mild peritonitis, 1 (?)
16 Dogs	20 hours to 301 days	10 animals 63% mortality	6 animals 27% recoveries	Excellent, 4. Good, 2. Fair, 2. Poor, 8.	Adhesions in all but one; delicate in younger, firmer in older specimens. Urinary sac formed as in rabbits and guinea pigs + omentum, 4. Mild adhesions, no sac, 4. Dense adhesions, no sac, 6. No record, 1	Normal, 11. Normal (?), 1. Mild to marked diffuse peritonitis, 3. No record, 1
Summary, 40	20 hours to 301 days	30 animals 75% mortality	10 animals 25% recoveries	Excellent, 32%; good, 11%; fair, 5%; poor, 52%. Chief symptoms, quietude, anorexia, weakness and diarrhea	Adhesions, 97.5%. Urinary sac, 50%. Mild adhesions, no sac, 18%. Dense adhesions, no sac, 29%	Normal, 79% Infected (usually not severely), 21%

REVIEW OF LITERATURE

AUTOPSY FINDINGS					REMARKS
At Point of Division of Ureter	Peritoneal Involvement	Retroperitoneal Tissues	Kidney and Ureter	Abdominal Wound	
Closure of ureteral incision by adhesions of peritoneum and adjacent viscera	No diffuse peritonitis	Not involved	In 3, hydronephrosis; in 1, gangrene of the kidney	In 3, primary union; in 1, urinary fistula 10th day, which closed spontaneously 18th day	Object of operations was production of continuous absorption of urine through peritoneum. Local adhesions prevented this
Apparently but little reaction	Marked peritonitis in most if not all animals. Decomposition of urine, which was diffused throughout the peritoneal cavity	Not involved	No statement	Infected in all cases. Not possible to obtain primary healing	Straus holds infection comes from two sources: (1) abdominal wound and (2) interior of intestine through its wall
Not stated	"Serious inflammation" in all	Probably not involved	No statement	No statement	Insufficient details render this report very unsatisfactory
Seven, closed by adhesions Four, ureter opened into abscess	One, diffuse peritonitis. Occurred after dividing ureter a second time when already infected. See text.	Abscess in 2	Both dilated in nearly every instance	In 2, infection; in 4, primary union: in 5, probable primary union	Results of escape of urine into peritoneal cavity: (1) local adhesive peritonitis; (2) absorption leading to uremia
Local adhesions occluded ureter	Not involved	Not involved	"Moderate hydroureter and hydronephrosis"	No infection	These two dogs were the beginning of a series which was not completed
Occlusion by (1) adhesions to gut or omentum, (2) by blood clot in lumen of ureter, (3) by organization of exudate. Walling off of ureter in 77%, especially in rabbits. Sometimes "cyst - like cavity" formed around cut end of ureter	Peritonitis always found; earlier in rabbits than in dogs but more frequently diffuse in latter. In herbivora, localized at side of divided ureter. Free fluid containing urea in about 50%, greater during first 48 hrs. Cultures peritoneal cavity, positive all dogs and cats and 50% rabbits	Edema, especially in rabbits	Noticeable or marked dilatation of both in 66%; oftenest, rabbits. Fluid under great tension	"Primary union * * * in 50% of herbivora; never in carnivora"	Microscopical study was made, but results are not important
Marked limiting adhesions in 75%	Diffuse peritonitis in 25%	Rarely involved	One or both dilated in about 83%	Clean, about 67%. Infected, about 33%	Too miscellaneous to be summarized

WRITER'S EXPERIMENTS

Retroperitoneal Tissues	Abdominal Wound	Kidney Side of Operation	Ureter Side of Operation
Normal, 12. Edematous, 3. Containing urinary sac, 1. Hemorrhage, 1. No record, 1	Healed ideally in all	20 hrs. to 8 da., congested and edematous, 12. 11 to 22 da., cystic and moderately enlarged. 157 da., cystic and markedly enlarged. 129 to 264 da., cystic and smaller than normal, 2. No record, 1	Prior to 11th da., slight enlargement, 12. After 11th da., marked dilatation, 6. Ureter dilates much earlier than kidney
Normal, 3. Edematous, 2. Containing urinary sac, 1	Healed ideally in all	1½ to 10 da., congested and edematous, 5. 15 da., cystic and considerably enlarged, 1.	1½ to 10 da., slight enlargement, 5. 15 da., diam. 4 x normal, 1
Normal, 13. Containing urinary sacs, 2. No record, 1	Normal, 9. Infected superficially, 6. No record, 1	20 hrs. to 9 da., slightly enlarged, 6. 18 to 32 da. and 182 da., moderately cystic and enlarged, 6. 203 da., very cystic and enormously enlarged, 1. 210 da., moderately cystic and atrophied to one-fifth normal size, 1. 301 da., solid and atrophied to one-fifteenth normal size, 1. No record, 1	20 hrs. to 9 da., slight dilatation to 3½ x normal diam., 6. 18 to 32 da., dilatation from 2 to 7 x norm., 5. 182 to 301 da., enlargement from 4 to 12 x norm. diam., 1. No record, 1
Normal, 74%. Edematous, 13%. Containing urinary sacs, 13%	Aseptic, 85%. Infected (generally not severely), 15%	1st 10 da., slightly enlarged. 10 to 32 da., moderately cystic and enlarged. 32 to 301 da., cystic and enlarged or cystic and contracted or solid and contracted. Usually enlarged.	1st 10 da., enlarged slightly. 10 to 32 da., 2 to 4 x norm. diam. 32 to 301 da., 4 to 12 x norm. diam.

poured forth is sooner or later absorbed in spite of the presence of peritonitis.

"The fluid was usually clear, yellowish, and of a urinous odor. When tested it always showed the presence of urea. Occasionally it was bloody and turbid and in carnivora purulent."

As to the source of the infection, whether localized or diffuse, there seems to be no doubt that it must come from one or more of three sources, namely, (1) the blood, (2) the urine, and (3) the intestinal tract by migration through its wall. Barney considers the last the most likely. On taking numerous cultures from the intraureteral fluid several days after ligation and also from the urine as it escaped from the incised ureter immediately after complete division, he found these fluids all sterile. These results, Barney[1] says, "agree entirely with those obtained by Gayet and Cavaillon[3] in similar experiments. * * * This is sufficient, I think, to prove that infection does not come through the urine or through the kidney." On the other hand, when Barney found the gut adherent to the cut end of the ureter, on taking cultures both from the renal fluid and from scrapings of the mucosa of the adjacent intestine, he found in each instance pure cultures of precisely similar cocci. While he does not claim that this evidence is final proof, he very rightly considers it to be "most suggestive." In regard to the blood as a source of infection following complete division of the ureter, neither Barney nor any other investigator offers any evidence or opinion.

Another factor which may influence the occurrence of infection is the composition of the urine. This may have a great deal to do in causing the diversity of results found in different kinds of animals and in the same kind at different times. Lumiere, Lumiere and Chevrotier[6] have shown "that in laboratory animals, especially dogs, the urine varies considerably from day to day, even under a constant regime * * *." This may "explain the contradictory results of experiments in so-called healthy animals." The reaction of the urine also must be considered, especially as this chemical condition effects bacterial growth. Park,[7] for example, has shown that the streptococcus, staphylococcus, colon ballicus and bacillus proteus valgaris do not multiply in strongly acid urines, while the staphylococcus and colon bacillus will grow in moderately acid urines. These facts of bacteriologic research, taken in connection with the other data given above, constitute a problem which, as far as the writer knows, no one has worked out.

The retroperitoneal tissues are invaded still less frequently than the general peritoneum. The ureter being a retroperitoneal structure, one might think that the urine would work its way up the side of this tube. But this seems to be a rare occurrence. Willgerodt's[11] dogs which developed abscesses behind the peritoneum were subjected to more than simple division of the ureter. In one he resected a small piece of the bladder wall, including the normal vesical opening of the ureter, as explained above, and in the other he inserted an ivory tube into the renal end of the severed ureter. These extra procedures may explain in part at least the involvement of the structures posterior to the serosa.

The Abdominal Wound.—The healing of this incision is about the same in this operation as in the average laparotomy in animals. In one of Willgerodt's[11] dogs the wound separated on the fifth day and allowed the intestines to prolapse. This is not by any means an unknown accident even in aseptic human cases. Straus'[9] statement that it is impossible to obtain primary union of the abdominal wall after division of the ureter is abundantly disproved by the other investigators.

The Kidney and the Ureter.—In practically every animal in which any obstruction developed at the point where the ureter was severed, more or less dilatation of both of these structures was found; and in a few instances hydroureter and hydronephrosis occurred without any demonstrable obstruction. The degree of distention of these structures was often marked. Willgerodt[11] and others frequently compare the size of the ureter to that of a lead pencil or of the little finger. No experimenter seems to have kept an animal long enough for secondary renal atrophy to supervene. In many instances, the intrauretero-renal fluid was purulent. Of course, to the extent that ureteral blocking occurs at the point of division, to the same extent the ultimate results will be

precisely similar to those of simple ligation. In my experiments on ureteral ligation,[5] I found that the fluid which collected above the ligature nearly always contained bacteria, contrary to the observations of Barney.[1] Part of this discrepancy may be due to the fact I kept most of my animals alive longer than Barney kept his, thus allowing more time for the development of infection.

A brief summary of the experimental work on intraperitoneal complete division of one ureter is as follows: six investigators have taken up this subject at various intervals from 1881 to 1910. They operated upon more than 57 animals, chiefly dogs and rabbits. Their mortality was about 50 per cent. General symptoms, particularly vomiting, diarrhea, coma and convulsions, occurred frequently. The cut end of the ureter was occluded by adhesions in about 75 per cent of the animals. Diffuse peritonitis developed in about 25 per cent of the cases, while the retroperitoneal tissues were rarely involved. The abdominal wound healed aseptically in 67 per cent of the experiments, fully as high a percentage as is found in most aseptic laparotomies in animals for other purposes. The kidney and ureter were practically always dilated whenever appreciable obstruction to the ureter was produced. The most significant fact of all is the limiting adhesions which close the ureteral incision, check the urinary leakage and prevent the development of diffuse inflammation.

WRITER'S EXPERIMENTS

Technic.—This was aseptic in every particular. The details were the same as those carried out in the writer's experimental work on ligation of the ureter.[5] That the method was effective is evinced by the fact that there was almost no evidence that any infection was introduced into the peritoneal cavity through the laparotomy opening. The incision was always made as far caudad as possible and approximately in the medial line. The bladder was pulled up outside the abdominal cavity, thus bringing up within easy reach the lower portions of the ureters which lie in the posterolateral ligaments of the bladder. The ureter usually was dissected from its bed for about a half inch before it was divided. In the rabbits and guinea pigs the ureteral artery was severed with the ureter because it was not practicable to separate them. In most of the dogs the ureter was isolated from its artery and the latter was left uninjured.

No ligature was placed on the vesical end of the ureter for three reasons: first, probably no urine escaped through this end because in normal animals the uretero-vesical valve prevents any reflux of urine from the bladder into the ureter. This fact has been demonstrated by numerous experimenters. Secondly, leakage of urine from the bladder through the vesical segment of the severed ureter would not invalidate the object of these investigations. In the third place, these experiments were planned to simulate as nearly as possible accidental division of the ureter in operations upon human beings where, of course, no ligature would be placed. In a few of the dogs the renal end of the divided ureter was mobilized thoroughly for about one inch in order to give the escaping urine free access to the peritoneal cavity and to avoid infiltration of the tissues retroperitoneally. This procedure, however, was unnecessary, for retroperitoneal involvement was not found in any of the dogs where this was not carried out. The abdominal wound was closed in three layers and no dressings were applied. As to care following the operations, all of the animals were kept in excellent quarters which were properly heated during cold weather. The rabbits and guinea pigs were handled very carefully, but the dogs had to be left with a keeper, who handled them very roughly and was not careful in feeding them.

Eighteen rabbits, 6 guinea pigs and 16 dogs were operated upon in this investigation, a total of 40 animals. Good material was obtained from nearly all of them.

Rabbits.—From these animals specimens of the following ages were obtained: one, 20 hours; one each, 1, 1½ and 2 days; two, 2¼ days; one each, 3½ and 4 days; two, 4½ days; and one each, 5, 8, 11, 22, 129, 150, 157 and 264 days. The mortality was 78 per cent in spite of the fact that they had most excellent care. About 56 per cent were very ill all of the time. They were quiet, would not eat, were very weak and almost uniformly suffered from diarrhea. A large proportion of the rest were ill at first, but recovered after one to five days; the 157-day rabbit belongs in this group. A very few were in good condition from the first and then died rather suddenly. The one that was killed on the 129th day was in fine condition practically all of the time.

The cause of death in the 78 per cent that died spontaneously probably in most instances was toxemia due to absorption from the retained, decomposed and more or less infected urine. This, however, is a negative assumption due to the fact that usually no other cause could be found from the autopsy findings. Those that died soon after operation may have succumbed from shock.

Autopsy Findings: Ureteral Incision.—In 100 per cent of the rabbits definite adhesions were formed walling off the region of the operation and preventing the diffusion of urine. In 70 per cent a very definite cavity or sac was formed bounded usually by the bladder, the abdomino-pelvic wall and some portion of the intestinal tract; in females the uterus, etc., were included. (Figs. 1 and 2, U. S.) It is surprising how infrequently the omentum was involved, contrasting in this

regard with the dogs. Sometimes in rabbits not even the intestine was included. These sacs always communicated with the ureter of the operated side through the severed end. These spaces differed greatly in size and shape in different rabbits, varying in various dimensions from about 1 to 9 centimeters. Three of the largest ones extended up to or above the kidney of the same side. (Fig. 1, U. S.) In the older specimens the adhesions were stronger, of course, than in the younger ones. As to the relation between the size and the duration of the lesion, the largest cavities with one exception occurred in specimens three weeks old or less. These sacs were always filled with urine or a urinous fluid and the inner surfaces were covered with incrustations. In the 157-day rabbit there were three intraabdominal urinary cysts: one at the right of the bladder, one at the apex of this organ, and one in the region of the appendix. The one at the right of the bladder probably was formed first and the others secondarily. One of the 4½-day rabbits had a moderate sized intraperitoneal sac which communicated with a very large retroperitoneal one. The latter no doubt was formed secondarily. In four animals the adhesions around the point of division of the ureter were formed so promptly and were so strong that the ureteral opening was occluded at once and no urinary cavity was formed. (Fig. 3, M.)

Kidney and Ureter.—In the specimens a few days old the kidney was more or less congested and there was slight dilatation of the pelvis. This enlargement usually increased proportionately with the age of the specimen. In lesions several weeks old enlargement and sacculation usually were marked and the cavity always was filled with urine or a urinous fluid not under tension. Two of the oldest specimens, however, presented exceptions to the rule of general enlargement found especially in more recent lesions; for in the 129- and 264-day rabbits, although the kidneys on the side of operation were cystic, yet they had undergone general atrophy, or diminution in size so that they were distinctly smaller than normal. One of these is shown in Fig. 5. This is a case of secondary atrophy as is explained in the description of the figure. The ureter was slightly distended in recent specimens and in older ones it was dilated from two to eight times its normal diameter. (Figs. 3, 4 and 5.) On the whole, the ultimate changes in the kidney and the ureter following complete division of the latter are the same as those described by the writer in a former article on ligation of the ureter.[5]

Peritoneum, Retroperitoneal Tissues and Abdominal Incision.—The peritoneum seldom was infected and was not involved otherwise except as it helped to form the urinary cysts. There was no free fluid in the abdominal cavity. The peritoneum does not allow the urine to be broadcasted throughout the peritoneal cavity, but dams it back by adhesions, forcing it to accumulate in a newly formed urinary sac in about 70 per cent of the rabbits and ultimately in the ureter and the kidney in all of them, so that the results of ureteral division are the same as those of ligation except that the effects of the former appear more slowly. (Figs. 3, 4, 5 and 6.) This walling off of the urine as if it were pus is the most significant fact demonstrated by these experiments. The retroperitoneal tissues were involved in only four instances: in one of the 4½-day rabbits there was a large retroperitoneal cyst; in two, there was considerable edema, while in one marked hemorrhage was found. The abdominal incisions all healed normally. The amount of infection present in the structures close to the urinary tract was surprisingly small considering the fact that bacteria could be found in abundance in the urinary spaces, the ureters and the kidneys.

Guinea Pigs.—Six specimens, 1½, 3, 4½, 5, 10 and 15 days old, were obtained from these animals. The mortality in this group was 100 per cent. Four of them seemed to be in excellent condition after operation and died suddenly without apparent cause. The other two were ill all of the time and their deaths were sudden. In none of them did autopsy reveal a sufficient explanation of death. In four it might have been due to absorption from the urinary space formed around the point of division of the ureter. In the other two no such sac was found; and one of these lived longer than any of the others, dying on the fifteenth day.

Autopsy Findings.—In every one of the guinea pigs definite adhesions limiting the spread of the urine were produced around the incision through the ureter. In four of them cavities were formed, varying in various measurements from 1.3 to 2.75 centimeters and precisely similar in every way to those described in the rabbits. In two pigs firm adhesions sealed the incision in the ureter and no sac was found. The peritoneum was involved in only one animal. The retroperitoneal structures were normal save marked edema in one pig and the formation of a urinary space in another. All of the abdominal wounds healed aseptically. The kidney on the operated side was more or less congested in all of the more recent specimens; in the 15-day one there was also considerable hydronephrosis. The corresponding ureters were dilated two to four times their normal size. The amount of infection present was exceptionally small. On the whole, the reaction of the guinea pigs to the operation was very similar to that of the rabbits except that the former all died much sooner so that no older specimens were obtained from them. For further details, see description of younger rabbit specimens.

Dogs.—In our series of these animals we obtained the following specimens: one, 20 hours; one each, 5¼, 6 and 7½ days; two, 9 days; one each, 18, 19½, 24, 28, 32, 119, 182, 203, 210 and 301 days. Although the mortality in this group was high, 63 per cent, yet it was decidedly lower than in the guinea pigs and rabbits. The fact that the weather was cold and that the dogs had to be left with a caretaker who did not handle them well may have contributed to this result. Urinary absorption, no doubt, was an important element, especially in the four dogs in which a new urinary space was formed. The symptoms varied considerably. The four that were allowed to live from 119 to 301 days were in excellent

condition all of the time. This was true even of the 301-day dog, which developed a rather long-continued lumbar fistula. Of those that died spontaneously, about one-half were in poor condition throughout the entire time and the other half were in good condition at first and very sick later. Vomiting and diarrhea were not uncommon and coma frequently supervened a few hours before death.

Autopsy Findings: Ureteral Incision.—In all but one dog there were limiting adhesions in this location; in six, they were strong and closed the opening very securely; in three they were rather weak. A new formed urinary sac into which the divided ureter of the corresponding side emptied was found in four of these animals; two of these were retroperitoneal and two intraperitoneal. The structures almost uniformly involved in these adhesions were the omentum, bladder, intestines and abdomino-pelvic wall. In only one animal was the omentum not included. This finding contrasts with that in rabbits and guinea pigs where the omentum usually was free. This behavior of this structure may account for the less frequent formation of urinary spaces and the more prompt occlusion of the incision across the ureter in the dogs than in the other two groups. This feature also would naturally lead to a lower mortality in the dogs.

Kidney and Ureter.—In the dog that lived the shortest time (20 hours) the kidney on the operated side was approximately normal. In all of the other dogs this kidney was more or less cystic and was dilated from about 1¼ to 15 times normal size, depending mostly on the age of the specimen; during the first two or three months the older the lesion the more marked usually was the enlargement. In the oldest specimen, however, the kidney on the operated side frequently showed more or less diminution in size. This was the case with the 210- and 301-day kidneys; both were reduced in size, the former to about one-fifth and the latter to about one-fifteenth of normal. The 210-day organ was cystic, the decrease in size, though noticeable, was not extreme and the corresponding ureter was markedly dilated. These findings are typical of secondary atrophy. This kidney was precisely similar to the rabbit kidney shown in Fig. 5. The 301-day kidney showed practically no cystic transformation, it was exceedingly reduced in size and its ureter was but little dilated. (See Fig. 6.) These features place it in the group of primary atrophies.

The ureter on the operated side showed but little change in the dogs that lived only a few days; in all of the others (except the two described above in which general renal atrophy occurred), the diameter was increased from two to ten times normal and the walls were rather thin. In all of the dogs (also guinea pigs and rabbits, except the rabbit kidney shown in Fig. 5) the urinary sacs, ureters and kidneys were filled with urinary fluid which was not under tension.

Peritoneum, Retroperitoneal Tissues and Abdominal Wound.—Inflammation of the peritoneal membrane occurred in three of the dogs; in one it was mild; in one, purulent; and in one, diffuse. The other dogs were normal in this respect, except, of course, that the peritoneum was involved in the adhesions formed around the point of division of the ureter. The retroperitoneal tissues were normal in all of the dogs except the two in which urinary sacs were formed in this location. Infection of the abdominal wound occurred in five dogs, but only the skin and subcutaneous tissues were involved. These infections were due mostly to the fact that dogs lick and scratch their wounds and tear them open. Rabbits and guinea pigs do not molest them and hence have but little trouble in this respect. Gross signs of infection in the tissues near the urinary tract were not usually present, although numerous bacteria could be found nearly always in the fluid in the urinary sacs, ureters and kidneys.

SUMMARY

(1) The mortality in the writer's animals was 75 per cent; the average of other investigators, 61 per cent. The death rate was highest in the guinea pigs (100 per cent), less in the rabbits (78 per cent), and lowest in the dogs (63 per cent). These results contrast with those of Barney,[1] who found the smallest death rate in herbivora. It is evident, therefore, that complete division of the ureter is an exceedingly grave occurrence, but not necessarily fatal. As compared with ureteral obstruction, it is decidedly more serious; the mortality in the writer's experiments on ureteral ligation was 69 per cent. The added danger from an opened ureter is due mostly to the toxemia from absorption of decomposed urine from the tissues outside the urinary tract; for of course absorption from these loose structures is greater than through the uretero-renal epithelium. Probably the mortality of this accident in human beings is not so great as in animals on account of the impracticability of giving to the latter as good care as to the former.

(2) The chief symptoms in the writer's animals were anorexia, weakness and diarrhea. Most of the animals were quiet the greater portion of the time. These symptoms are about the same as those found by other investigators except that they observed convulsions and coma rather frequently.

(3) The most striking feature of our experiments as well as those of other investigators is the activity of the tissues in the vicinity of the severed ureter in preventing the spread of the escaping urine. In some instances the reaction is so prompt that the ureteral opening is sealed at once.

More frequently a urinary sac is formed by adhesions between the intestines, omentum, bladder and body wall. This urinary cavity may contract and be obliterated or may remain unchanged indefinitely or may increase in size; also secondary sacs may develop from the original one. Limiting adhesions occurred in all but one of the writer's animals.

(4) The amount of infection in the peritoneum (21 per cent), retroperitoneal tissues (13 per cent) and abdominal wound (15 per cent) was surprisingly small in all of the writer's animals. Other experimenters have not been so fortunate; they have had from 25 to 33 per cent of infections in these locations.

(5) The effects of this operation on the kidney and the ureter are the same as those of complete ureteral obstruction if the animal lives long enough except that the results develop more slowly in the former; also in ureteral division there is the added feature in about 50 per cent of the animals of the formation of a urinary cavity at the point of division of the ureter. During the first two or three months after complete severing of a ureter it gradually dilates and the kidney suffers cystic enlargement. After three or four months dilatation still continues in more than half of the animals, while about 44 per cent of the writer's specimens show more or less marked general renal atrophy (decrease in size) on the operated side. A kidney in this reduced and quiescent state is, of course, entirely harmless to its possessor.

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DISCUSSION

Dr. L. F. Turlington, Birmingham, Ala.—The fact that a cut ureter left free in the abdominal cavity did not kill any of the animals, is very comforting to those who do surgery. The symptoms presented by the dogs, the anorexia and so forth, might be a hint to us in diagnosing the trouble in the human, and I think that if we apply this to our own work we may get something out of it. It is very comforting to me to think that if I should cut a ureter in two the patient might get well, or that he stands a 37 per cent chance of doing so, even in the event that the trouble is not diagnosed.

Dr. M. Y. Dabney, Birmingham, Ala.—In human beings a severed ureter usually occurs in the female following pelvic operations. It most often occurs in cases of fibroid of the cervix, which destroy the normal relationship. They are often associated with hemorrhage, and the patient may be in *extremis* and in no condition for more surgery.

There are about nine possible things to do when a severed ureter is discovered. If the condition is extreme one might put in a drain and do nothing else. Another thing is to bring the ureter to the surface and allow it to drain. The third thing is a ureteral anastomosis. Another method of treatment is an anastomosis into the cervical stump in cases of hysterectomy, and next into the vaginal cuff or into the sigmoid. A nephrectomy may be performed, as one of my colleagues has done, at the same operation.

The uretero-ureteral anastomosis or the ureterovesical anastomosis and the ligation deserve attention. A few years ago in the East it was shown that when a ureter is cut, if an anastomosis is performed a stricture will follow, and that the benefit is of very short duration. Following that a few men began simply to ligate cut ureters and were successful in the absence of infection of the kidney.

Transplantation into the bladder is more apt to take than any other sort of repair if the severance occurs reasonably near the bladder, but so far as I can learn this always results in a huge dilatation of the ureter. Whether this is due to scar tissue formation around the site of the anastomosis, I cannot say, but the ureter becomes enlarged and infection follows.

Dr. Jones (closing).—Dr. Turlington seemed to take too much pleasure in the fact that the patient would not necessarily die if one of her ureters were cut. I purposely avoided that statement, for I did not wish to bring out anything that would give anyone comfort if he should allow this accident to happen.

Dr. Dabney spoke of obstruction of a ureter leading to dilatation of that ureter and its corresponding kidney. This was one of the results I discovered in my experimental ligation of the ureter. If the animals survived the first stages of this procedure, in about 50 per cent of them the ureter on the side where the ligation had been done became reduced in size, sometimes primarily, sometimes secondarily, and the kidney became smaller, assuming a condition which was harmless to the individual. A rather large number of such cases have been reported in human beings. If we could experiment with the human we probably should find that in a considerable proportion of cases the kidney and the ureter on the ligated side would finally take on an atrophied and harmless state. The surgeons at the Mayo Clinic were among the first purposely to ligate a ureter as a means of disposing of the corresponding kidney when its ureter was irrevocably damaged. This has now become almost a standard procedure in such emergencies. If the patient, who nearly always is a woman, gets through the first stormy period, and she has about a 50 per cent chance at this stage, she has about another 50 per cent chance that finally the kidney will become reduced in size and remain harmless indefinitely.

FURTHER EXPERIENCE WITH SYNERGISTIC ANALGESIA*

By G. T. Tyler, Jr., M.D.,
Greenville, S. C.

Synergistic analgesia, induced by the combined action of two or more drugs, was made use of by Gwathmey and Greenough; and the results of their work appeared in the *Annals of Surgery*, August, 1921. They used magnesium sulphate, 25 per cent solution subcutaneously, in 30 to 50 c. c. amounts. This was diluted to 300 to 500 c. c. with sterile water before being given. Morphia in gr. 1/8 doses was given hypodermically at twenty to thirty minute intervals for two or three doses. Both were given one or two hours before operation. The results of their work were so convincing that their method was soon adopted by other clinics. They concluded that in the analgesic state patients were put to sleep with much less anesthetic, had little or no excitement, and were at all times pink. In addition, the post-operative course was smooth, morphia being required at longer intervals and in much smaller amounts.

After reading their paper, I began using synergistic analgesia, and have tried it in nearly 100 cases. My experience has confirmed the opinion of the authors mentioned. I have not made use of nitrous oxid-oxygen. Ether and occasionally novocain were the only anesthetics used.

By the time the patient reached the anesthetizing room he was apparently not interested in what was going on, and the anesthesia was induced without excitement. It was noted also by the anesthetist that less ether was required, and that it could be discontinued sooner, the patient often requiring none during the closure of a thick abdominal wall. Furthermore, in the post-operative course the patients had less nausea, less pain and distension, and required smaller amounts of morphia. This was not an invariable rule, but it was so noticeable that the nurses spoke of it, and the records bore out their testimony.

In continuing this work, I found one patient with senile gangrene under whose skin I hesitated to put Epsom salt, although there had been no sloughing or abscess following its use. Hence it was given per rectum, the morphia being hypodermic. The analgesia obtained in this case was so satisfactory that I ran a series of cases in which the magnesium sulphate was given only by rectum, and was convinced of its analgesic effect from the conduct of the patients in their anesthetic and post-operative course. One ounce was dissolved in four ounces of water and slowly injected after the patient had been given and expelled two enemas. This was given one and one-half hours before operation. At the same time, morphia was given in gr. 1/8 doses hypodermically at one-half hour intervals for three doses.

At that time I knew of no other work in which magnesium sulphate had been given per rectum. Dr. Gwathmey, in a letter received some weeks ago, said that he had the records of over 200 cases where it was used by rectum. His dosage is 8 gms. (120 gr.), combined with ether, oil, glucose, acacia, morphin and paraldehyde. Chloretone is also occasionally given by mouth or by rectum in association with the other drugs.

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The absorption of magnesium sulphate interested me, but I could find little information on the subject. Dawson and Goldschmidt had demonstrated that there was practically no absorption of sulphates from the large bowel. Dr. Goldschmidt suggested that a quantitative estimation of the sulphates in the urine might determine the question. Dr. David Smith made these tests for me, but found that the increase in urinary sulphates was so little as to be negligible. On the other hand, it was found by St. George, working in the Jersey City Hospital, that the magnesium in the blood was increased from 3 to 4 mg. per 100 c. c. of blood (the normal content) to 9 to 10 mg. in the first hour after 8 gm. had been put into the rectum. It gradually returns to normal in four or five hours.

How the magnesium acts is not known, but it is thought by Gwathmey that it holds the morphin in contact with nerve tissues for a longer period than if the morphia is used alone. Rector states that magnesium sulphate aids in absorption of the morphia and retards its oxidation in the body. Following Gwathmey's suggestions, he induced "colonic" analgesia. When later the anesthetic is given, it is discontinued immediately upon the loss of reflex sensation and muscular relaxation. Five variations of the method of inducing analgesia are given by Gwathmey, all of which include morphin and magnesium sulphate; but in no others is analgesia produced to the degree obtained by the subcutaneous method. My experience corroborates this statement. In some cases one can hardly say from the course of the anesthetic whether the magnesium sulphate had been given by rectum or under the skin; but in a series of cases the average is certainly in favor of the hypodermic use. It is not so convenient to give when much is to be done in the last few hours before operation. It causes pain also, unless novocain is given with it. I have not used per rectum ether, paraldehyde nor chloretone with magnesium sulphate as Gwathmey has done. I think, however, that these are excellent adjuvants, especially paraldehyde. Probably subsequent efforts will bring about better analgesic effects and make the results of rectal administration better than those already obtained. The simpler method of rectal injection warrants a trial.

Measures to insure a quiet, unexcited anesthesia, a smaller amount of the anesthetic, less post-operative pain, distension and nausea should appeal to surgeons. And when the likelihood of shock is much reduced, a further advantage is gained.

The method is not one in which less vigilance can be permitted. There are dangers to be avoided. Magnesium sulphate affects the respiratory centers in the medulla. If respiration becomes embarrassed, calcium chlorid intravenously will immediately counteract its effect. Gwathmey advises intravenous use of large amounts of salt solution; also the rebreathing of the expired air, the patient's own carbon dioxid stimulating his respiratory center. Cyanosis and loss of lid reflex are to be avoided. The patient must be pink throughout the anesthesia.

A study of one's cases will often take away enthusiasm for any special procedure. An occasional patient had no magnesium sulphate before operation and required no morphia afterward; but these are few. Only a large series of cases can furnish conclusive data.

For post-operative pain I have combined morphia with magnesium sulphate, 2 c. c. of the 25 per cent solution. While the number of patients so treated is not large enough to draw definite conclusions, my impression is that morphia combined relieves pain for longer periods than when used alone.

From my experience with synergistic analgesia, I believe it can be safely stated that:

(1) The excitement stage of anesthesia is much lessened, if not abolished.

(2) Less anesthetic is required, and shock from the operation occurs less frequently.

(3) Post-operative pain, distension and nausea are much reduced.

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DISCUSSION

Dr. Frank D. Smythe, Memphis, Tenn.—Since Dr. Gwathmey's report of his experience with magnesium sulphate, August, 1921, in the *Annals of Surgery*, I have employed the method described, modified somewhat, in all of my work, except when operating in the country or at some point where it was impossible to obtain a freshly prepared solution of magnesium sulphate.

The benefit of synergistic drugs is known and appreciated by all surgeons and used by most surgeons, though we sometimes see a surgeon who refuses to give a hypodermic of morphin or any other analgesic before an operation. We use synergists in our work for the reason that such drugs lessen the danger of the inhalation anesthetic, diminish its amount and enable us to perform the operation safely and successfully.

There is some risk, slight though it may be, in all inhalation anesthetics. This risk is decreased in keeping with the experience and competency of the one administering the anesthetic. I use gas-oxygen preceded by synergistic therapy, consisting of morphin sulphate, two or three doses, depending upon the size, sex and temperament of the patient, administered at intervals of twenty minutes, dissolved in a 25 per cent solution of chemically pure and freshly prepared magnesium sulphate. With the second dose I administer a 1/150 of a grain of atropin sulphate. Atropin is synergistic to morphin as an analgesic, but is physiologically antagonistic to morphin in its effect upon the respiratory center. Hyoscin and scopolamin are identical chemically and physiologically and are synergistic to morphin as an analgesic and as a respiratory depressant; and I think it is unsafe to combine these two powerful depressants, morphin and hyoscin, and administer them prior to the administration of an inhalation anesthetic.

I wish to record my favor of the use of atropin as a routine combination with morphin and my opposition to the use of scopolamin in combination with morphin. It may be used by men more experienced than I, but for the reasons submitted I would not use the combination.

I have operated upon over two hundred cases during the past year, using this technic in practically all cases. Most of the cases were abdominal and pelvic surgery, but other major operations are found in the list.

Almost every one upon the eve of an operation suffers from fright. This may at times be a complication of importance, and it must be controlled or removed whenever possible. The method described by Dr. Tyler in his paper has been used by myself for the past year or more, and has proven very successful.

The cooperation of every one who participates in the preparation of the patient for operation and of those assisting in the operation is necessary. An interne or a super-wise nurse may do much harm by volunteering opinions as to the wisdom of the method. It is best for the surgeon, where such lack of discipline obtains, to conduct the treatment himself or have his assistant or special nurse do so.

The first dose of morphin, one-eighth of a grain, is ordered administered one hour and a half before the time set for operation and is repeated every twenty minutes until three doses have been given. In the second dose, atropin is added to the morphin. In one hundred cases I used the larger amount of the solution as recommended by Gwathmey, namely, 200 to 400 c. c. of a 4 per cent solution given subcutaneously. Results were compared with a similar number of cases where the morphin was given in 2 c. c. of the 25 per cent solution, and the record showed that the analgesic effect of the morphin was not prolonged in the cases where the larger volume of the solution had been given further than was accomplished by the morphin given in 2 c. c. of magnesium sulphate alone. As the administration of the larger volume of the solution is somewhat painful, and some patients seriously object to it, we have discontinued the use of magnesium via hypodermoclysis, depending upon the use of morphin dissolved in 2 c. c. of a 25 per cent solution.

Patients thus prepared enter the operating room without apprehension or misgivings concerning the operation and its outcome. The amount of nitrous oxid necessary is reduced from 40 to 60 per cent, and the oxygen content is increased. In 50 per cent of our cases we found it necessary to use an amount of ether varying from one to six drachms. The cases requiring the addition of ether were usually gall-bladder or stomach cases. The anesthetist found it advisable to supplement the gas with ether and did so without consulting me.

The cooperation of the anesthetist and the surgeon is essential. Upon withdrawal of the nitrous oxid when the last sutures are being introduced and substitution of oxygen, it is found that the patient awakes just as the dressing is completed. The patient remains pink throughout the operation, the pulse varies from 80 to 90, being usually 84, and the post-operative progress is more smooth and much more satisfactory in cases operated upon prepared thus than when operated upon without synergistic drugs.

Novocain should be used within and under the skin in the deep fascia and the peritoneum.

Such a policy enables the surgeon to begin the operation before the patient reaches the stage of surgical anesthesia under the inhalation anesthetic.

Dr. John Darrington, Yazoo City, Miss.—The public is more interested in the going to sleep than in the operation. For that reason the local anesthetic has been accepted readily by the public. A great many people are willing to have an operation performed when they know it can be done without their going to sleep. A few years ago chloroform was used almost entirely by the surgeons of the South. We discovered that it was more or less a dangerous drug, whose mortality rate was too high. It required a large amount of skill to administer chloroform safely, and we selected ether, because it was safer in the hands of men unaccustomed to giving an anesthetic. We have gotten along well with ether, with a very low mortality, but we should have trained men to administer anesthetics, whatever they are. That is a great need in hospitals today.

A skilled anesthetist should be employed as well as a skilled surgeon.

Dr. Bertram H. Wagnon, Atlanta, Ga.—A little more than a year ago, following the paper by Dr. Gwathmey on synergistic anesthesia, we started using the salt, chemically pure, in giving morphin to patients. At the Infirmary we gave the morphin from ¼ to ⅛ grain and rarely had to give more than one hypodermic of morphin after an abdominal operation. Where we had been giving ¼ grain morphin and 1/150 atropin preceding operation we cut the morphin to ⅛ grain in 2 c. c. of magnesium sulphate solution. The nausea was noticeably absent after ether anesthesia. We used ether in all these cases, and while the patients reacted no sooner, they were more comfortable after the reaction. Whether the synergistic action of the magnesium sulphate was responsible for the reduction of nausea, or whether the reduction of the morphin was responsible, I have not been able to decide, but certainly the patients have been more comfortable since this method has been used. It is now done as a routine in the Dispensary. All the morphin is administered in a solution of magnesium sulphate.

Magnesium sulphate in local work with novocain has also proved satisfactory because the anesthesia lasts a much longer time. When the anesthetic effect of the novocain wears off the magnesium sulphate solution carries the anesthesia on for a much longer time. We found that if we did a local at 9 o'clock in the morning, sensation did not return until 3 in the afternoon, and the patient complained of no pain in the meanwhile. In one case where we used a 1 per cent solution of novocain in a 25 per cent solution of magnesium there was a slough at the line of suture when I injected a foreskin. However, it finally healed by granulation.

Dr. C. N. Cowden, Nashville, Tenn.—If you have trouble with ether it is because the anesthetist does not know how to give it. An expert should use not more than a third or half a can of ether, and from this the patient will have no bad effect. If too much ether is used the patient will be in shock for a long time and will vomit every time he comes out.

Morphin is the best thing in the world as an aid to ether anesthesia. It stops peristalsis in abdominal operations, and I have never understood why any one will fail to give his patient a comfortable twelve or fifteen hours with it.

The synergistic use of magnesium sulphate is of benefit, perhaps, but it is painful, and a few times I have seen sloughing, as the previous speaker said. In closing the wound the injection of a solution of novocain into the fascia is of assistance.

It is difficult to close the abdominal wall after an upper abdominal operation, but if the injection is used the anesthesia will last all the time and there will be no difficulty in bringing the wall together. We sometimes have trouble in healing our wounds with this solution in them. That is the only objection to using local anesthesia with the general.

We lost two patients with ether in the operating room in Nashville in one day because of the wrong administration of the ether, but we also hear of deaths under this new method. It must grow with the young men.

Dr. Tyler (closing).—I can only say that I would like you to make further use of this method. There has been little written as yet upon this method except what Dr. Gwathmey contributed in the last year to the *Annals of Surgery*. He has an article also in the *American Journal of Surgery*, October, 1922. If you will look over the detailed case reports, you will be convinced that there is virtue in the method and find it very simple. In obstetrical work it should be of much value. In the reduction of fractures I believe that many times the use of magnesium sulphate and morphin would almost obviate the need for general anesthesia, though I have not yet made use of it in this way. A short time ago a colleague told me that he had to care for a patient with an inoperable cancer of the uterus, and found that by combining magnesium sulphate with morphin he was able to cut down the morphin to a great degree and carry her along to her death with little discomfort. We are taught that nausea from the use of morphin occurs upon recovery from the morphin. If we can give less morphin to relieve pain, I see no reason why we should use more.

THE UTERUS IN MALPOSITION*

By Francis Reder, M.D.,
St. Louis, Mo.

There will always be an interest attached to a uterus in malposition on account of the selective treatment necessary for each individual case. A patient can only be given the best treatment when the gynecologist, familiar with the normal and abnormal conditions of the pelvis, makes a careful study of the existing lesion, and selects the treatment which in his judgment will prove most beneficial.

The evolution of technological progress in gynecology has been so rapid since the aseptic era in surgery has minimized the dangers of abdominal operations that the scalpel is virtually the master in gynecological treatment today. So far-reaching has become the horizon of the surgical measures that a graduate in medicine at the present time possesses a good knowledge of gynecologic surgery, but a rather vague understanding of any gynecologic methods in vogue at an earlier day.

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*Read in Section on Obstetrics, Southern Medical Association, Sixteenth Annual Meeting, Chattanooga, Tenn., Nov. 13-16, 1922.

Much of the work of our forefathers engaged in the practice of gynecology has become obsolete. There are, however, a few things left that fit into our present day practice which the gynecologist regards with the exalted consideration they deserve.

The more we advance in years the greater becomes our respect for our predecessors. It is with no hesitancy on my part, but with a feeling of interest, that I speak of the pessary as an aid in affording relief of the symptoms caused by a uterine malposition. Naturally, the question arises to what extent in our present knowledge of uterine deviations is the pessary a beneficial factor, and what advantages, if any, does the appliance possess over an operative measure?

In all uncomplicated displacements where the perineum is intact, a properly fitting pessary will relieve the symptoms in the majority of cases. It is the simplest method of treatment and with proper care is free from danger.

The pessary possesses no advantages over an operative procedure, as it is only a temporary measure aiding Nature in an endeavor to restore the tone of the tissues and induce a return to normal conditions. A surgical operation institutes a direct attack upon responsible structures in the hope of obtaining a more definite result.

There are, however, patients demanding relief from their suffering whose general condition contraindicates any surgical procedure. These are the old and decrepit; those with decompensated cardiac disease; and those with diabetes or advanced renal lesions; patients with pulmonary affections for whom an anesthetic would prove very dangerous; and there are also the timid ones. It is true much can be accomplished in present day surgery with spinal, sacral and local anesthesia. However, the fact must not be overlooked that the stage of surgical convalescence is in itself a serious factor and must be reckoned with.

It is in this class of patients that a pessary will often bring great relief and improve the general well being.

There is another class of patients in which the pessary fulfills an equally efficacious influence. In this class we find the retrocessed pregnant uterus which by its growth has become wedged below the promontory of the sacrum and is unable to free itself. The condition is of particular interest to obstetricians who will recognize that all is not right by the unusual vesical irritation, sensation of weight and pressure in the pelvis, pain in the back, and constipation. A manual examination readily discloses the condition, which demands immediate attention. The reposition, if no undue delay has been permitted since the onset of the symptoms, is usually not difficult. There may be conditions, however, when the patient will have to be anesthetized and reposition attempted in the knee-chest position.

After the gravid uterus has been freed, and before the third month of gestation, it will be prudent to introduce a Hodge pessary to forestall any tendency to relapse. After the fourth month the womb is of such size as to be retained in the abdominal cavity without difficulty, and the pessary can be removed.

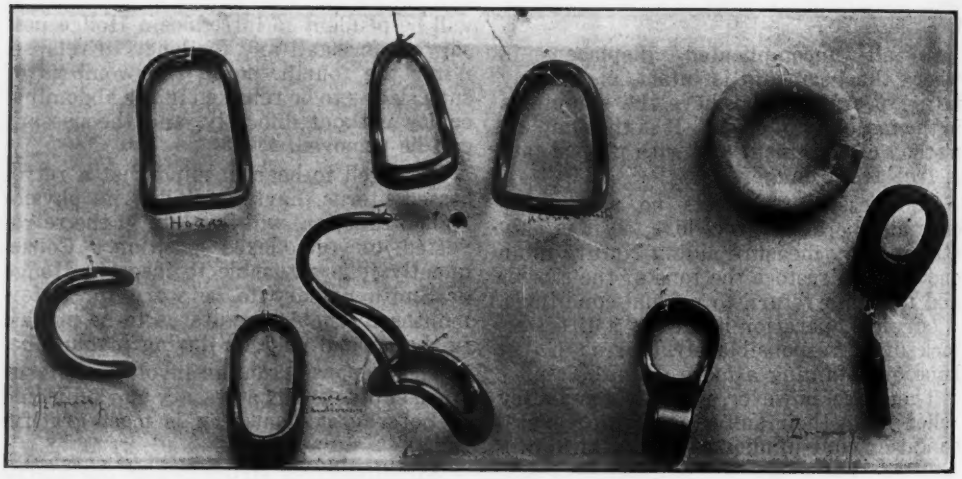
It is well to bear in mind that a retrocessed uterus, having fulfilled its physiological function, will involute in the retroverted or retroflexed position. Consequently it is advisable to insert a Hodge or Smith pessary to be worn for a few months to enable the uterus to be molded in the normal position during involution.

The response from an involuting uterus when supported by a pessary and subjected to hot vaginal douching is most gratifying.

All supporting structures of the uterus are muscular and in a physiological sense are adnexa. They evolute with the uterus during pregnancy and they involute with the uterus during the puerperium. If these structures are allowed to involute during the puerperium with the uterus in a retroverted or retroflexed position, an irremediable harm will befall these structures. They will become relaxed and suffer such loss of tone that they will be wholly inadequate to sustain the uterus in its normal position.

Recovery from this partially subinvoluted condition is only possible when the uterus is replaced, raised and held in an extreme forward position by a pessary. Both special care and skill are required in the care of a uterus whose tendency is to

retrovert during the puerperium. For such cases the pessary possesses an appreciable value. A subinvoluted retroverted uterus should, shortly after the lochia has ceased, be brought into anteversion bimanually and secured by a properly fitting pessary. Such a pessary must of necessity be rather large. As involution progresses and the structures, particularly those of the vagina, are gradually returning to normal, it will be found that within a week the original pessary will have become too large and that a smaller one must be substituted. At the end of a fortnight the contraction of the vagina will be such that the second pessary will have to be displaced by a still smaller one. After a few more weeks the third pessary will have to be supplanted by one of still smaller size. This staging with different sized pessaries, together with the hot vaginal douching, will secure an effective puerperal involution and usually a cure for the retroversion.



Vaginal pessaries.

As an adjunct to the woman who is in the child-bearing period, and who is in need of an operation for a retroverted uterus but declines because her family has not been completed, the pessary proves a satisfactory service. Such women not infrequently wear a pessary for many years except when pregnant, usually having it replaced a few months after childbirth and wearing it until well advanced in the next pregnancy.

We have all met with the so-called physiological vomiting during the early months of pregnancy, and we have seen such vomiting become sufficiently persistent or distressing to demand treatment. It should always be borne in mind that a so-called physiological vomiting may become a hyperemesis through neglect. In all cases when the act of vomiting appears to be unusually severe, a vaginal examination should be made to determine the position of the uterus. If this organ is found to be in malposition it should be corrected manually and a properly fitting pessary inserted. The assumption that such vomiting is to a considerable extent of a reflex nature induced by uterine irritation is supported by the relief obtained after the correction has been made. In such cases the pessary is to be worn for several months, or at least as long as there is a tendency to vomit.

It has been my good fortune to relieve in this manner quite a few patients from this distressing condition after other means (lavage, medication, etc.) had failed. Such experiences have imbued me with a very kindly feeling for this appliance.

Deviations of the uterus usually met with in gynecologic practice are either for-

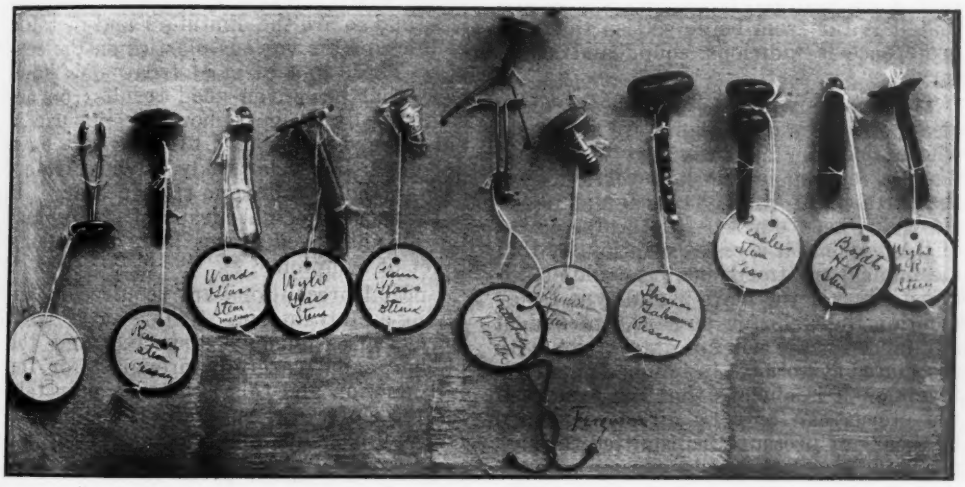
ward or backward displacements with or without a flexion, and the descensus of the first or second degree. These displacements are generally recognized by the symptoms they produce, or are discovered during a vaginal examination when the clinical picture in some vague manner suggests a pelvic trouble.

An uncomplicated version is not a serious lesion and is often free from symptoms. However, a woman with an abnormally placed uterus is always more liable to inflammatory attacks from slight exposures than if her organ were in a normal position. Most of these women have backaches and uncomfortable catamenia, and sooner or later are obliged to seek relief. The important fact must not be overlooked that in such a condition an ever-present passive hyperemia, frequently associated with active hyperemia and in itself a cause of subinvolution and hyperplasia, renders tissues vulnerable to slight causes of inflammation and makes an inflammation more obstinate when once excited.

In all uterine displacements a diagnostic refinement and a skill of high order is imperative so as to identify and differentiate properly an existing lesion.

The general health of the patient and the physical make-up must be carefully scrutinized. If there is any manifestation of visceral ptosis, it should be noted whether slight or marked. General symptoms help us but little further than to direct us to the necessity of a manual examination, which latter may or may not give definite information of the existing lesion. A flexion is often more easily diagnosed than a version, because in the former the curve or bend of the uterus enables it to be followed in the vagina with ease.

Should additional information be desired recourse to the uterine sound will become necessary. The uterine sound is an innocent looking instrument; however, in the unskilled hands of an inexperienced physician it can do a great deal of harm, and should therefore be used with conscientious caution.



Intrauterine pessaries.

The treatment of the majority of uterine malpositions, even when conditions have not reached an extreme stage, is today mostly by surgical operation.

It is my conviction that many uterine displacements do not require surgical measures for their relief, and that a correction can be accomplished by a less drastic measure with equally gratifying results. From this class must of necessity be excluded deviations the result of inflammatory complications, neoplasms, or abnormalities in the supporting mechanism which predispose to displacement, and

which will predispose to their recurrence unless they are corrected by operation.

In referring to the less drastic measure, I speak of the pessary. This appliance is undoubtedly well known to you. Perhaps many of you have forgotten it, or have become prejudiced against it because you did not obtain satisfactory results. Perhaps you thought the appliance might be harmful. Perhaps you did not take sufficient interest to acquaint yourself with its mechanics and technic, or possibly you may have been influenced too favorably by the operations of the present day for these conditions.

It is true an operative measure is perhaps the quickest remedial way in dealing with a malposition, but let me say to you that it is far from being settled that this preference is judicious, sound and necessary.

Treatment with a pessary is often disappointing and versions are met with where a pessary has been very ineffective. Such a version is the anteversion. Although a great variety of vaginal pessaries have been devised for the treatment of this version, it is only exceptionally that mechanical treatment has been found satisfactory. Of the more useful type I may mention the Gehrung pessary, an efficient appliance for the relief of anteversion with associated cystocele. In influencing an anteversion it is obvious that the fundus of the uterus can only be directly elevated by means of pressure transmitted through the bladder. Such a transmission of pressure may more often do harm than good.

The Gehrung pessary requires a studied technic for its insertion. Presumably this accounts to some extent for its lack of popularity.

Inasmuch as an anteversion is generally an indication of increased weight of the fundus uteri, satisfactory relief has been obtained by the insertion of a Hodge pessary or a Meigs elastic ring. The beneficial action of these pessaries exerts itself by elevating the whole uterus and limiting its mobility.

In looking at the complicated anteversion pessaries originated by Thomas, Hewit and Barnes, one cannot help appreciating the deep concern these gynecological masters entertained for this version.

Frequently a flexion is combined with an anteversion. Whether or not this flexion is pathological can only be determined through diagnostic finesse. Suffice it to say that before the age of puberty some flexions are common and are considered normal. When in after years the uterus reaches its full development and becomes firmer, such flexions straighten themselves. There are, however, anteflexions that are pathological, especially those that are acquired. These flexions frequently tend to produce obstructive dysmenorrhea, and probably also sterility.

In instituting a treatment for an anteflexion, even of moderate degree, the reasoning powers of the gynecologist are severely taxed. Vaginal pessaries are useless, and so are the dilatators and metallic bougies, or the various plastics on the cervix. There is a form of treatment, however, that has given good results; on account of its dangers, however, its use is not to be recommended to those who have not given it special study. I have reference to the intrauterine stem pessary. It is the most effectual means of straightening an anteflexed uterus and of causing relief of symptoms.

Special precautions are required in applying an intrauterine stem pessary. Aseptic measures must be respected and the uterine canal carefully prepared for the introduction and this is often a painstaking piece of work, especially if the patient is a nullipara or unmarried.

Like the vaginal pessary, they are to be used not as a permanent support but as a temporary one to be worn for a limited number of weeks or months. During the time a patient is wearing a stem pessary she should be carefully observed. A mucous surface covered by cylindrical epithelium is not likely to tolerate pressure and friction altogether with impunity and may resent the intrusion of such a foreign body. An irritation evidenced by pain and a rise of temperature demands prompt removal of the stem. The selection of a stem pessary calls for excellent judgment, and it will not be long before it will be known whether or not the selection has proven a good or bad one.

Special precaution is necessary as to the length of the stem. It must be neither too

long nor too short. According to measurement it should be at least one-half inch shorter than the uterine cavity. The material of which the intrauterine pessary is made, the thickness of the stem, and the style of the appliance must also be considered in making a selection. My preference rests with the annealed glass stem without a vaginal disc. The vaginal disc is supposed to keep the stem in place, and is often a source of irritation to the vaginal wall and cervix. However, I can say that no stem remains in place, except the pessary of a Chambers or Carstens type, having spreading stems. All other pessaries will be gradually forced out of the uterine canal and into the vagina unless they are sewed to the cervix. This can be readily done with bronze wire by piercing both the anterior and posterior lip and securing the wire ends with perforated shot.

The bronze wire is used as a sanitary measure. It is pliable as twine and does not become foul from absorbing the secretions. The thickness of the stem should be such that it is freely movable within the uterine cavity.

It is well, however, before a stem pessary is secured by suture simply to introduce and support it with a special vaginal tampon to test the uterine tolerance. If, after a week, nothing of an untoward nature occurs, the pessary can be secured in the manner suggested.

Probably the most successful usage of the vaginal pessary is in the relief of symptoms the sequence of a retro-deviation, in maintaining or modifying the position of the uterus. A retroversion is the most frequent of the uterine malpositions. It is a common ailment with women who have given birth, whose care during the involuting period of the uterus, usually the first six months after the birth of the child, has for some reason been neglected. Retroversions are occasionally met with in nulliparous women, the causation being chiefly of a nutritional and developmental character. It may, however, be the result of a fall.

The symptoms that usually present themselves are common to most uterine maladies, being due to associated hyperemia, endometritis and metritis. Prominent is the dull, heavy headache, the bearing down sensation occasioned by a beginning descensus, vesical irritation and rectal tenesmus. Should a flexion be associated with a version, the symptoms may be aggravated and cause great suffering, especially during the menstrual time, when the exit of the fluid and mucus is rendered less free.

The first indication for a retro-deviated uterus to be subjected to a pessary support is to restore the organ to its normal position, provided there are no adhesions binding it down and preventing replacement. This may be generally and effectively accomplished by placing the patient in the semi-prone position, or better still, by resorting to the genu-pectoral position. The index finger is then introduced per vaginam and the posterior wall of the passage pulled backward so as to allow atmospheric pressure to come into play. This will usually suffice to reduce the displacement. If a flexion has been associated with the version, the reposition of the retrocessed uterus will permit the coils of small intestine to again fall into the retrouterine fossa of the peritoneum, where they may exert a part of their function by pressing chiefly upon the posterior surface of the uterus, thereby tending gradually to reduce the flexion.

A retroverted uterus brought into an anterior position can be successfully supported by a properly fitting pessary. Of these pessaries there are a great variety—a few, however, will answer all purposes. They are principally the Hodge, Thomas and Smith. To be able to select a pessary which will satisfactorily meet the existing conditions is an accomplishment that can only come from an extensive experience, and mastered by those who can readily appreciate technically mechanical facts.

A pessary is a sort of a lever, a splint if you please. When in place it should not over-distend the vagina. It should not rest against the pubic rami or any bony support, but should be held by the elastic walls of the vagina. It should be possible to pass the index finger easily between the pessary and the pubes, and the patient should be unconscious of its presence.

If a flexion is superimposed on a retro-deviated uterus, a not uncommon occurrence, and remains obstinate as can be

elicited by the symptoms, the treatment by stem, similar to that described in anteflexions, will often prove efficacious. This does not mean, however, that the vaginal pessary can be discarded. The uterus must be supported in its antepoise.

There is another malposition I wish to speak of, mainly on account of the minor importance attached to it. It is the uterine descensus, not the extreme state of prolapsus, but the degree without appreciable displacement of the uterus. This condition is not uncommonly met with in multipara and is often the result of general laxity and weakening from malnutrition of the structures sustaining the uterus at its pivotal point. The severer forms with hypertrophic elongation are usually the outcome of neglected minor degree prolapses, are associated with an extensively traumatized pelvic floor of long standing, and occur most frequently in multipara. Relief for this latter condition rests with an operative measure. A prolapsed uterus, not necessarily of an advanced degree, impairs the patient's comfort and capacity for exertion. Bladder and rectal irritation, pain in the back and loins, a sensation of weight in the pelvis and an annoying leucorrhea are the usual symptoms. It is a condition that will continue indefinitely unless relieved.

The recognition of a descensus in its earlier stages is sometimes not an easy matter. If the patient is examined in the semi-prone or in the lithotomy position, an existing prolapsus cannot always be satisfactorily demonstrated. It is when the patient is examined in the standing position that the correctness of the diagnosis can be ascertained more definitely.

The indications for the treatment of a descensus are two fold and are similar to those for the treatment of a retrodeviation. The first indication is to return the displaced organ to its normal position; the second indication is to retain it there. Reduction is usually accomplished manually without difficulty, and the genu-pectoral position will be of the greatest value. In those cases where the pelvic floor has not been robbed of its normal sustaining power, and no appreciable visceroptosis or the presence of a tumor can be demonstrated, the uterus can be sustained in its normal position by a properly fitting pessary. This form of malposition should receive the same judicious and exacting consideration when selecting a pessary as the other forms of malposition. It must be borne in mind that in reality four organs are to be supported, viz., the vagina, uterus, bladder and rectum.

In the moderate cases of descensus the pessaries that can be used with proper reserve and caution are Meig's elastic ring, Hodge's, Thomas', Hewitt's, Smith's and Galabins'. My preference has been for the elastic ring wherever applicable. It has given satisfaction in the greater number of cases, is easy of introduction, and possesses the advantage over the other pessaries that it cannot become displaced.

In conclusion, I may say that I fully appreciate the modern concept of treating a uterine malposition, and though I have spoken of the vaginal and intrauterine pessary with much mental reserve, knowing full well the present attitude of the gynecologist in regard to these supports, it cannot be denied that a pessary, either vaginal or intrauterine, is still entitled to a legitimate place in the treatment of uterine displacements.

DISCUSSION

Dr. T. S. Field, Jacksonville, Fla.—As I have grown older in practice I have found more need for pessaries than ever before. There are three conditions in particular in which I find the pessary invaluable. One is for retrodisplacement after a wasting disease such as typhoid fever. That is frequently seen in the nullipara. In this condition a properly fitting pessary which gives the ligaments a chance to regain their strength will cure the condition. In displacement due to post partum subinvolution of the uterus a pessary is invaluable as a cure if you have an adequate perineum. It is my practice to examine the patient on the tenth day post partum, and if the uterus is misplaced to insert a pessary to support it until involution has taken place. It is also my practice to have the patient report six weeks post partum to check up, and not infrequently I find retrodisplacement at that time which I had not noticed at the end of ten days. In these cases I always put in a well-fitting pessary. Lynch of California says that in 2000 cases he found 44 per cent of retrodisplacements following labor. These women are chronic invalids if we do not do something for them, in a large percentage of cases. Do not think that I say that all women who have retrodisplacement are invalids, because thousands of them have it without any symptoms. But if we put in this pessary with an adequate

perineum following labor, we can correct the condition entirely. But a pessary must be properly put in, so that the woman is not conscious of the fact that she is wearing it.

Backache is due to retroversion in a good many instances, but it is also due to chronic endocervicitis, and if we have retrodisplacement with a chronically inflamed cervix we must operate to cure the endocervicitis if we wish to cure the backache or we shall have cases with perfectly good position of the uterus still complaining of backache.

For the uterus in anteflexion, the pessary has been worthless in my hands. In most cases I found a return of the symptoms two or three months afterward. Also there is a chance of infection coming from the stem pessary, and almost 50 per cent of those who have dysmenorrhea have something in the abdomen which we did not suspect.

Dr. Edward Speidel, Louisville, Ky.—It should not only be the custom to examine women before they leave the hospital, but they should be examined three to six months later, because it will very often be found that cases that apparently were not retroverted at the original examination will show retroversion later.

A number of us have treated cases of hyperemesis in which we have found retroversion and have neglected to put in a pessary.

The stem pessary used in the uterus should be comparatively short, so that it goes just slightly beyond the internal os. Otherwise, if it is secured to the uterus by means of sutures, the uterus will force the stem down and the sutures will tear through the cervix, and you will have a bilateral laceration of the cervix.

Dr. E. T. Newsom, Sheffield, Ala.—My experience with pessaries of different types is only of three years' duration. They work in some cases if they are properly put in. Six months from the time I put in a pessary I remove it, and if the uterus returns to retroversion, I tell the woman it is no use to temporize any longer and advise immediately opening the abdomen and shortening the round ligaments. I take pains to see that the round ligament is firmly fixed in the inguinal canal. If the round ligament is attached to the uterus in its normal position anatomically, I do not bother it. If it is attached lower, I fasten the round ligament higher up on the fundus so that it will bring the uterus forward. I do the Crossen operation. An inadquate perineum is also repaired.

I wish to say a word in defense of the stem pessary. I see on the Doctor's chart there the one I have been using, the Baldwin glass stem pessary. The one I use is a straight glass rod, and they come in different sizes and lengths. The only objection I know to its use is that it stimulates the vascular supply to the uterus and adnexa and might light up some disease that is smoldering there. Careful bimanual examination will prevent this. It is as safe as dilatation or curettage, which are done often inadvisedly. Curettage of the uterus is good for nothing but to secure material for pathological examination. I do not think you will cure any disease of the endometrium in that way. Most of the cases of leucorrhea are endocervical in origin.

I have these stem pessaries in four women at the present time. They are doing what is claimed for them. I carry the pessary high up in the cervical canal and fasten it with a silver wire and split shot. I try to fix it so that it goes inside the uterus, but is far enough down from the fundus so that when the uterus does contract the fundus will not impinge upon the distal end of the pessary. The pessary is intracervical and intrauterine, and will stay in that position for six months if it be fixed with silver wire of proper size and if the correct length of pessary is selected.

Dr. Reder (closing).—I did not wish to be guilty of inflicting upon you some old, dug-up stuff. This subject is of considerable interest at the present day, and yet of course it is old. Hippocrates was the first to insert a pessary in the vagina. He died about 360 B. C., but the pessary is still used.

It is in the septic condition, in the toxic condition, where the body suffers eventually from a high degree of malnutrition, where relaxation of the structures takes place, where tissue tone becomes less, that our attention is called to various organs of the body.

A COMPARATIVE STUDY OF NEISSERIAN INFECTIONS IN THE MALE AND FEMALE URETHRAE*

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and
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We are often so engrossed in what we consider the great problems of surgery and medicine that we do not give sufficient time and thought to diseases of so-called minor importance. This has always been true of the profession's attitude toward infections in the male and female urethrae. Gonorrhea is considered a self-limited disease of minor importance. Some urologists, like the old Roman physicians, believe it beneath their dignity to allude to gonorrhea.

The minute structure and pathology of a diseased urethra is not generally under-

*Read in Section on Urology, Southern Medical Association, Sixteenth Annual Meeting, Chattanooga, Tenn., Nov. 13-16, 1922.

stood, and for this reason much misdirected treatment is applied to the gateway of the upper urinary tract. In no infection is it so important for the surgeon to have a thorough knowledge of the structural development and methods of diagnosis and pathology as in the common infections of the urethra. Symptomatology, pathology and treatment must be studied together. The closest cooperation and sympathy should exist between the clinician and pathologist. Not all discharges from the urethra, with many of the clinical manifestations of a Neisserian infection are gonorrhea, and in the subacute or chronic urethral discharge only the most skilled bacteriologist can name the offending organism, if a diplococcus is in question.

Fig. 1.—Case No. 1. Girl, age 18. Negative history. Infection of 18 months' duration. Clinical and smear diagnosis (four laboratories), gonorrhea. Our repeated cultures showed staphylococci and colon bacilli, but no gonococci.

Dr. Franklin P. Johnson,[1] of the Brady Urological Institute, by a series of wax reconstruction models of the male and female urethrae, has taught us much from a comparative study at various stages of fetal development. We are greatly indebted to him for allowing us to use some of his illustrations.

He demonstrates the entire homologue of the prostate in the female for the first time. He has shown that the female urethra corresponds to that portion of the male urethra lying between the vesicle opening and the prostatic utricle. Coincident to the formation of prostatic ducts in the male there appear similar glands in the female. The urethral glands in the female correspond to the prostatic ducts which lie above the orifice of the prostatic utricle. Skene's ducts are the homologues of the prostatic glands which lie below the orifice of the prostatic utricle. Bartholin's and Cowper's glands are true homologues. The practical teaching of this work should appeal to all. The growth

Fig. 2.—Another picture of Case 1, showing "creamy" pus massaged from Skene's glands, preparatory to making culture.

of the urethral glands in the female is retarded and in the adult they are fewer in number, not so close together, have thicker walls, fewer branches, and secrete less. The vestibule of the female corresponds to the remaining portion of the male urethra from the prostatic utricle outward. In dealing with infections in the female urethra, which is homologous to a part of the prostatic urethra, we have a more accessible field in which to work both for diagnosis and treatment. In the male, infection of Littre's glands means a prolonged course because we have actively secreting glands to deal with; while its homologues in the female, the minor vestibular glands, are seldom infected.

Fig. 3.—Case No. 2. Infection of two years' standing. Clinical diagnosis on admission, gonorrhea. Smears negative. Repeated cultures showed staphylococci and colon bacilli. No gonococci.

Gonorrhea of the female urethra, like the illegitimate child, is very frequently disclaimed by both urologist and gynecologist. By inheritance and classification the infected female should be the property of the gynecologist. We do not believe that physicians are so careful in eradicating the gonococci from the peri-urethral glands in the female as they are in the male. A definite criterion of cure can be maintained only by repeated clinical and laboratory studies.

Fig. 4.—Case 2, showing enormous thickening of peri-urethral tissues. Para-urethral ducts gaping.

The clinical picture of acute gonorrhea either in the male or female is too well understood to be dwelt upon at this time. The diagnosis of subacute and chronic gonorrhea is most difficult and should only be made or denied by a close cooperation between clinic and laboratory. In the female the diagnosis is especially difficult to establish or deny. In this connection the collection of material is very important. Cultures should be made of material from the

urethra and peri-urethral ducts or from Bartholin's glands, just as we examine the massaged contents of the prostate and seminal vesicles. The examination should be made with a definite routine labeling slides and cultures from each suspected area. This requires a vast amount of routine work, but, with a skilled bacteriologist to cooperate, it is well worth while.

The presence or absence of the gonococcus in the male and female urethra is of

Fig. 5.—Same as Fig. 4 after massage. Note great drops of pus from para-urethral ducts.

supreme importance. Dr. Edward L. Keyes, Jr.,[2] says:

"Let us delay a moment to compliment the gentlemen who are able to diagnose the presence of gonococci in the urethra by the finding of a few intracellular gram-negative cocci. Scattered organisms, whether intracellular or not, whether gram-negative or not, do not mean anything. Even when the cells are packed with gram-negative organisms, the certainty is not complete. These gram-negative organisms packing the cells may be staphylococci. Should the clinic and laboratory disagree, the laboratory may be defied to cultivate the gonococcus. Positive gonococcus culture is positive proof of the presence of the gonococcus and takes precedence over all other evidence."

It is a prevalent opinion in many localities that the gonococcus is grown with such difficulty that its routine identification by this means is entirely impracticable in clinical work, yet methods for its growth are too numerous to mention.

We have made various attempts at finding a method for the cultivation of the

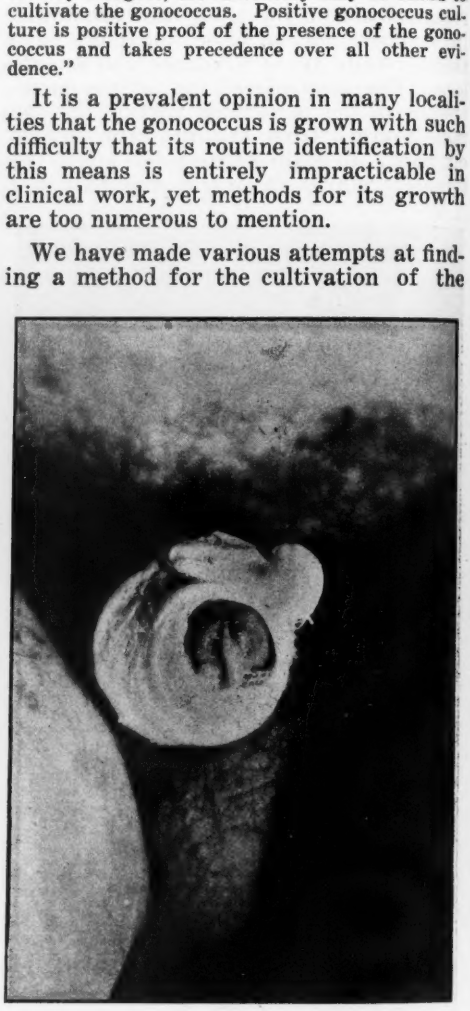

Fig. 6.—Case No. 3. Negative history. Repeated negative smears (our laboratory). Clinical diagnosis, gonorrhea. Culture positive for gonococci.

gonococcus which would be at once accurate, practical and simple. We feel after two years of its routine use in clinical diagnosis that we can heartily recommend Swartz'[3] method. Briefly, this is to prepare slants of the culture medium consisting of ascitic, hydrocele or serum agar of a suitable reaction containing an abundance of moisture. After inoculation of the surface of the slant the oxygen ten-

sion is lowered 10 per cent or more by heating the upper part of the tube culture and inserting an air-tight rubber stopper. We have found that pyrex tubes will stand the heating with less danger of breaking. Examination of the cultures can be made satisfactorily 24 to 36 hours later. Most strains grow abundantly and all preserve their colony characteristics and staining reactions. The lowering of the oxygen tension, furthermore, has an inhibitory action upon the growth of the usual saphrophytic organisms found and the gonococcus has for the first 24 hours, at least, an advantageous start in its growth. It is not at all unusual in acute gonorrheal infections to secure a pure abundant growth of the gonococcus in perhaps 90 per cent of the cases. In the others, and especially in the subacute and chronic cases, it may be necessary to pick the typical colonies from the primary culture and identify the organism by morphology, by staining reactions, and further cultural studies.

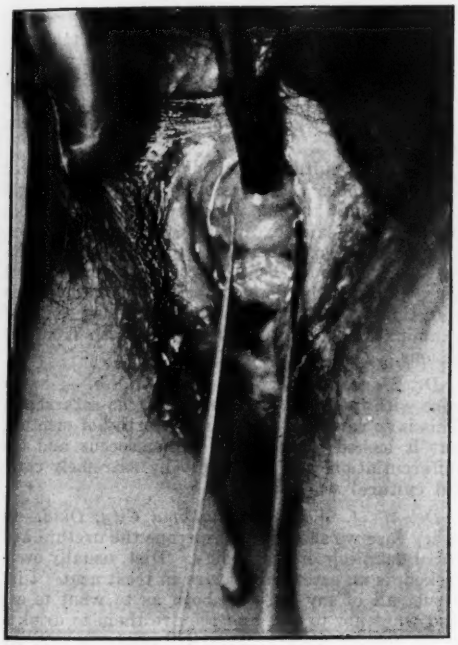

Fig. 7.—Illustrating the necessity for locating para-urethral ducts, both for obtaining material for diagnosis and determining treatment.

It is advantageous, as Swartz points out, to store the rubber-stoppered slants in the incubator, inoculate them promptly without chilling and lower the oxygen tension by heating the upper part of the tubes, replace the stoppers, and return the cultures immediately to the incubator.

In doubtful cases for diagnosis and in medico-legal cases the cultural evidence should never be dispensed with. As Keyes has stated, the positive culture takes precedence over all other evidence.

Fig. 8.—Emphasizing one successful method of treating Skene's ducts.

As a means to the determination of a cure, cultures of the urinary sediment in males and of the material from Skene's ducts and peri-urethral ducts in females will occasionally reveal living gonococci which might easily have been overlooked.

The method furthermore readily lends itself to the prompt preparation of autogenous vaccines, if these be desired, and to the securing of numerous strains furnishing abundant material for the preparation of antigens for use in complement fixation work.

Probably no two of us agree exactly on the best method of treatment for acute gonorrheal urethritis. Methods and drugs are legion and results are generally unsatisfactory. We are very much interested in calling your attention to what we shall call fundamental principles which must be applied to your method of choice. The suc-

cess of your favorite drug will depend upon how you apply it. Gentleness of application is more important than the selection of what you believe to be the all-important drug. Be kind to the already angry mucous membrane and do not traumatize it. We daily see cases of virulent gonorrheal infections in the male urethra with all the classical symptoms of a severe acute inflammation using irritating injections. This is only one example of misdirected treatment. In such a condition the physician is directing his patient to traumatize a very acutely tender meatus, to add insult to an already angry mucous membrane, thus defying a well known surgical principle. Too much is said nowadays about a favorite drug or method and entirely too little about when and how to use them.

In acute gonorrheal urethritis in the female, we should insist that the patient report regularly for treatment to a specialist who daily watches the progress of the disease and changes his treatment accordingly. We must not be satisfied with prescribing a vaginal douche and having the patient return when convenient.

In chronic gonorrhea of the female where Skene's glands are almost always infected, we have irrigated with a Luer syringe and blunt-pointed needle with most pleasing results. Where the duct is partially stenosed, we pass a fine probe and incise, or better, fulgurate. The latter procedure has given excellent results in our hands.

We intentionally omit any lengthy discussion of treatment for the various stages of gonorrheal infections, and we do not advocate any single drug or group of drugs because we feel that the method of treatment should be selected for each individual case.

Honesty and sincerity of purpose, gentleness of application, perseverance added to a thorough knowledge of the underlying pathology will usually indicate the proper method of procedure.

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DISCUSSION

Dr. Milton Weinberg, Sumter, S. C.—A thorough knowledge of the structural development of both the male and female urethrae and of the pathological processes of gonorrheal infection in these tissues is essential for the intelligent treatment of such infections. Whether the urologist or gynecologist should treat infections of the female urethra is a matter of little concern.

There is a distinct field of usefulness in the application of cultural methods for gonococcal infections, but they fall far short of fulfilling our need. It is still a difficult proposition in many cases to know whether or not a sub-acute or chronic gonorrhea is present.

Undoubtedly, cultural methods should take precedence over all others in making a positive diagnosis of the organism. It is only in this manner that we can be absolutely certain that the intracellular, gram-negative diplococcus is a gonococcus or not.

Certainly, cultural methods should be employed wherever there is a possibility of a medico-legal case. Though the making of cultures for the gonococcus is an aid, except in occasional instances, I do not believe that in the ordinary routine clinical work in gonorrheal infection it has yet added very much to the determination of whether such infection is present over the usual procedure of examination of the smears made fresh from the lesions.

Dr. Montague L. Boyd, Atlanta, Ga.—I had a case with infection of the micrococcus catarrhalis. This is so rare that it is hardly worthy of mention, but it looked exactly like a gonococcus and the differentiation was made only by extremely careful cultural work.

Dr. W. J. Wallace, Oklahoma City, Okla.—In every case we should urethroscope the urethra and learn definitely its pathology. Diet, usually overlooked, is an essential feature in treatment. I instruct all of my patients both as to what to eat and what not to eat, and require them to drink a great deal of water. This will apply to both the acute and the chronic cases.

I want to mention something which is not popular with the majority of urologists, from the use of which I am getting beneficial results. This is the administration of vaccine. I give it only in chronic cases and in complications following the acute condition. In the acute cases I have never found vaccine to be of any advantage. The method of giving it is as follows: usually begin with ten minims, subcutaneously, the first day, eleven minims the next day, and increase this daily until it reaches fifteen minims. If there is no marked reaction, I hold it at this amount, giving it each day until from fifteen to twenty doses have been administered. If the reaction is very great I reduce the amount, but do not discontinue the vaccines. It is my intention to keep the pa-

tient on the positive phase or just on the crest or edge of fever, until the last dose. Then I give from sixteen to twenty minims, hoping, thereby, to produce a marked reaction. The vaccine, given in this manner along with the general or combined treatment, will unquestionably benefit the majority of these cases.

Dr. H. W. E. Walther, New Orleans, La.—I have had some success with the high frequency spark in treating the female urethra. I use the high frequency electrode through the skenenoscope, an instrument that Dr. Stevens, of San Francisco, presented to us in New Orleans.

In regard to vaccines, I have to cross swords with Dr. Wallace, and many other men would do likewise. I have tried them in many ways, ascending and descending doses, autogenous and stock, and I have never yet seen any good results whatever follow their use.

Dr. Henry S. Morris, Nashville, Tenn.—I have been treating gonorrhea of the male and female for thirty-five years, and if I understood the Doctor to say that a Neisserian infection occurring in the male and female is a minor affair, life is a joke! When we refer to the alarming consequences that follow inadequate treatment of the female as revealed by the number of cases that go to the operating table for removal of the sexual organs and the loss of the function of reproduction, are we not struck with the necessity of giving these cases our utmost consideration? These cases, when improperly treated, rapidly assume the chronic state and then we are confronted with a problem which requires the most thorough skill to check the advancing destructive process.

It is difficult to estimate with any degree of accuracy the number of cases of gonorrhea, especially of the female, existing at present, as a very large number of such patients do not apply for treatment. I believe more are seeking relief, however, since the war, and the intensive work of our Government in behalf of venereally infected persons. Information from this source as well as magazine propaganda and the enlightenment of the present times is doing much toward a better state of affairs as relates to the female in all classes of society. We should work, work, work, and treat, treat, treat until we have relieved these patients. As far as treatment is concerned, that is, the manner and method of its application, there is much variance of opinion, but you should attend to it with all your skill.

Dr. T. S. Field, Jacksonville, Fla.—I wish to say a word in defense of the gynecologist. I just heard your essayist say that the gynecologist treats these patients in a haphazard manner and, being a gynecologist, I naturally took offense at that. I have treated many of these cases and do not believe that they can be successfully cured without extirpating the glands of the cervix. I have seen many cases which were apparently cured, with the discharge stopped, which infected some one else in later months. I cannot cure gonorrhea without extirpating the cervical glands.

Dr. Paul Gelpi, New Orleans, La.—One point is very important and that is the culture of the gonococcus. We have been told that many samples of stock vaccines had been examined and found free of gonococci. From the standpoint of diagnosis the cultural method described is exceedingly useful. As I understand it, the details are all important and must be carried out in just the right way. From the medico-legal standpoint also this paper is of great import.

Dr. Harry Young Righton, Savannah, Ga.—It is as essential to massage the urethral glands in the female in making a diagnosis as the prostate gland in the male. We have recently seen several cases where the urethra was involved but no infection had reached the cervix of the uterus. These cases can be treated most successfully by one of the latest agents, and that is mercurochrome. After you make the diagnosis, the patient is requested to urinate before you begin treatment to obviate the possibility of carrying infection to the internal sphincter. You then distend the urethra with mercurochrome, employing a glass bulb syringe. This can be done without pain and solution should be held there for several minutes.

In the treatment of cervicitis and endometritis, I have obtained results with the following treatment: I put the patient in an exaggerated lithotomy position, lift her buttocks about 45 degrees and fill the vagina with a 5 per cent solution of mercurochrome. I keep the patient in this position for about five minutes and use mercurochrome tampons. The next day much of the discharge from the cervix is colored red. Mercurochrome has a penetrating effect in the cervical gland. I also swab out the cervix, as it is usually plugged, and then put in a piece of cotton soaked in mercurochrome. I have many cases that I have followed for a long time, which cleared up not only culturally but by the clinical symptoms as well.

Dr. McKay (closing).—For fear some one may miss one of the important points of the paper, I will say that we have a cultural method which Swartz has perfected which is an easy procedure and by which we can verify our diagnosis in the sub-acute and chronic cases. In the acute cases clinical examination plus examination of smears is about all we need, but in the subacute and chronic cases we need some practical method to verify our diagnosis. If you will try growing the gonococcus as described by Swartz, you will find it a simple method which can be employed routinely.

If we are to progress in handling these cases we must be more careful about our diagnoses.

THE SO-CALLED RAILWAY SPINE*

By F. Walter Carruthers, M.D.,
Little Rock, Ark.

There is no doubt that there is not a man present at this meeting who has not handled or seen many railway cases that has not been confronted with what he calls a "railroad spine." But turning to the serious side of this so-called condition lies a very important problem that confronts the railway and industrial surgeon. As orthopedic surgeon for the Rock Island Railroad and several industrial plants, I have seen and been confronted with a great number of spinal cases.

Before taking up the question of treatment, let us study the spinal column from an anatomical point of view.

The spine is made up of several sections, the cervical, dorsal, lumbar, sacral and the coccyx. Its primary accessories are the ribs, ilium, ischium and pubis. The cervical and dorsal regions with their accessories the ribs, give us very little concern, but the lumbar, sacral and coccyx regions, with their accessories are a very different problem.

The anatomists tell us that in the sacrum and coccygeal portion of the spine with its accessories the pelvic bones constitute a very complex combination. From an early period of life, it consists of nine separate pieces, which unite in the adult to form two bones, five entering into the formation of the sacrum, four into that of the coccyx. The sacrum, formed by the union of five vertebrae, has thirty-five centers of ossification. It is furthermore classed as the false vertebrae. From the examination of a large number of skeletons it would appear that in one set, the anterior surface was nearly straight, while in others the middle portion showed a marked curve. In others it was hard to show much difference between the first two varieties.

All the above points are mentioned merely to remind you of the many varieties and complications that one encounters when one has to deal with a spine case. I shall show on the screen a number of dissected specimens. I shall try vividly to recall to your mind the anatomy in this region, and shall show you how it looks, step by step, to impress upon your eye and mind the real importance of this region.

Let us turn our attention to what is presented from the x-ray standpoint of these backs.

It is with considerable hesitancy that I approach the subject of x-ray findings, not because of any lack of faith in them, but on account of the inability to show the gross pathology to those who are always doubtful.

The x-ray of the lumbro-sacral and sacro-iliac region of the spine offers a very interesting field of study. We should if possible, have some knowledge of the relationship between the back symptoms and the x-ray findings in these cases.

Those of you who have studied the x-ray findings in these regions will agree with me that it shows an almost unlimited variety, and at times it is almost impossible to state just what is normal as compared with abnormal.

Dr. Archer O'Reilly, of St. Louis, made a very careful study of a number of dissected cadavers in this region, and came to the conclusion in his series that there were no marked abnormalities. However, on comparison of the x-rays before dissection, and his findings afterward, he saw that the dissected specimens showed some osteo-arthritic changes that the x-ray did not show.

I wish to show you on the screen a number of different varieties of lumbar, sacro and iliac spines, and in doing so to call your attention to the striking similarity between backs that give no symptoms and those that do. I wish to emphasize the question of liability in those so-called injuries in comparison with negative findings in the case. The point that should be taken by the large industries is a careful examination and x-ray of those cases that give the slightest history of any previous back trouble, in order to have a check on the case in any future trouble.

The patient's pictures that I wish to show range in age from 20 to 60 years.

*Read before the Southern States Association of Railway Surgeons, Auxiliary of the Southern Medical Association, Sixteenth Annual Meeting, Chattanooga, Tenn., Nov. 13-16, 1922.

In each case I have tried to secure the same type of back to compare with the one that is giving the trouble, in order to show the striking similarity and irregularities at the lumbo-sacral articulations in persons suffering with backache, as compared with those who have never had a back symptom. One should be very, very careful in case of injury, in stating that there has been a displacement or fracture as result of an accident.

In the varieties I wish to show, a most common type is that in which the sacrum is set low between the ilia, with a comparatively narrow sacro-iliac joint. This gives the suggestion of weakness at this point and the likelihood of a sacro-iliac strain. The long lumbar space in itself is very suggestive of the same thing. This is the type that gives a great deal of trouble.

The other varieties are the common fan-shaped transverse process, the bifurcation of the first sacral vertebra, and the overlapping transverse process of the fifth lumbar.

Another important thing in this connection is the question of fracture of the spine. I shall show you on the screen pictures of the following case:

A female, age 21, was brought to the hospital in a state of semi-consciousness. Her friends stated that about one hour before while in a downtown department store shopping she opened an elevator door, stepped in and fell through the shaft, landing on a concrete floor, fifteen feet below. She was picked up and carried out profoundly unconscious. Thirty minutes later she developed convulsions which lasted thirty minutes. After arrival at the hospital she would at times be aroused and complain that her back hurt.

Examination showed a young woman well developed and nourished with marked pallor and evidence of profound shock. However, she could be partially aroused. The pupils were regular and reacted to light and accommodation. Both shins and knees were bruised. At the region of the twelfth dorsal vertebra there was a slight kyphosis, and on pressure over this region she complained of pain. There was no other complaint.

The x-ray of the spine was made in both the anterior-posterior and lateral positions. It is very important in these cases that the x-ray be made in both directions, for it is very easy to overlook a fracture in attempting to diagnose your case from the anterior-posterior view alone, as may be seen by the picture.

Fractures of the spine are practically all reduced by flexion and extension, the procedure carried out in this case. In due time, after a properly fitted Taylor spine brace was applied, she was permitted to be up.

Fractures of the spine are rather common things and should not be considered serious if there are no neurological findings. If these are present, the injury should be judged according to the symptoms.

DISCUSSION

Dr. W. W. Harper, Selma, Ala.—We have been disposed rather to ridicule these backs, because we have not been able to find any gross pathological lesions. I have more sympathy with these cases than I used to have, for I have been suffering with a lame shoulder for two months. The symptoms came on suddenly without any apparent cause. After having been examined by several good doctors, an orthopedist diagnosed a neuritis of the circumflex which resulted in a partial paresis of the deltoid. This allowed the arm to drop and make traction on the capsule of the shoulder joint. The neuritis was from a focal infection and pain and disability were cleared when a dead tooth was removed.

In the type of cases reported by Dr. Carruthers there is an abnormal mobility in the sacro-iliac joint and a cure will be effected only when an arthrodesis is done.

Dr. Theodore Toepel, Atlanta, Ga.—In any kind of concussion of the spine, whatever it may be, rest is of primary importance. If rest does not relieve the condition, further investigations must be made and perhaps operative procedures be resorted to. I want to relate one case, which may be of interest to you. One of my patients suffered with a sacro-iliac strain similar to those mentioned by the previous speaker, from an accident which occurred when she was six months pregnant. She went the full term and gave birth to a healthy child. The accident occurred when she started to step off a street car and before she landed safely on the ground the car started while her hand was still on the hand rail of the car. This gave her a sudden jerk and she fell and severely injured herself. I was called in about three months after she had given birth to the child. She could not get up with comfort and when she did, suffered with excruciating pains in the region of the lower back. She had been told to get up and exercise. After a thorough examination I advised an x-ray, which confirmed my diagnosis of a separation of the bones of the sacro-iliac joint. Owing to the condition of the patient at the time of the accident a relaxation of the ligaments of the joint had taken place. I treated this case by absolute rest in bed and strapping by adhesive bands for six weeks. I then allowed her to get up, wearing a snugly fitting sacro-iliac belt. She is now able to move about and pursue her usual household duties.

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Fractures of the spine are rather common things and should not be considered serious if there are no neurological findings. If these are present, the injury should be judged according to the symptoms.

DISCUSSION

Dr. W. W. Harper, Selma, Ala.—We have been disposed rather to ridicule these backs, because we have not been able to find any gross pathological lesions. I have more sympathy with these cases than I used to have, for I have been suffering with a lame shoulder for two months. The symptoms came on suddenly without any apparent cause. After having been examined by several good doctors, an orthopedist diagnosed a neuritis of the circumflex which resulted in a partial paresis of the deltoid. This allowed the arm to drop and make traction on the capsule of the shoulder joint. The neuritis was from a focal infection and pain and disability were cleared when a dead tooth was removed.

In the type of cases reported by Dr. Carruthers there is an abnormal mobility in the sacro-iliac joint and a cure will be effected only when an arthrodesis is done.

Dr. Theodore Toepel, Atlanta, Ga.—In any kind of concussion of the spine, whatever it may be, rest is of primary importance. If rest does not relieve the condition, further investigations must be made and perhaps operative procedures be resorted to. I want to relate one case, which may be of interest to you. One of my patients suffered with a sacro-iliac strain similar to those mentioned by the previous speaker, from an accident which occurred when she was six months pregnant. She went the full term and gave birth to a healthy child. The accident occurred when she started to step off a street car and before she landed safely on the ground the car started while her hand was still on the hand rail of the car. This gave her a sudden jerk and she fell and severely injured herself. I was called in about three months after she had given birth to the child. She could not get up with comfort and when she did, suffered with excruciating pains in the region of the lower back. She had been told to get up and exercise. After a thorough examination I advised an x-ray, which confirmed my diagnosis of a separation of the bones of the sacro-iliac joint. Owing to the condition of the patient at the time of the accident a relaxation of the ligaments of the joint had taken place. I treated this case by absolute rest in bed and strapping by adhesive bands for six weeks. I then allowed her to get up, wearing a snugly fitting sacro-iliac belt. She is now able to move about and pursue her usual household duties.

EYE, EAR, NOSE AND THROAT

SOME OBSERVATIONS ON EYE LESIONS OF NASAL ORIGIN*

By Joseph D. Heitger, A.B., M.D.,
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When we consider the intimate relationship existing between the contents of the orbit, i. e., the eyeball as a whole with its extrinsic muscles and optic nerve, blood and lymph vessels, and the nose with its accessory sinuses, which are exposed to repeated attacks of an inflammatory character, it becomes a source of wonder that eye lesions of nasal origin are not more frequent. Their frequency, proportionately small though it is, presents an interesting field for study and has developed a voluminous literature composed of the researches and reports of Hajek, Sluder, Onodi, Uffenorde, Woakes, Van der Hoeve, Wright, Loeb, Dean, Gradle, Posey, Bordley, Brawley, Thomson, Stark, Ellet, Vail, deSchweinitz, Holloway, Peter, Reber, Shumway, White, Haitz, Bissell, Lloyd, Cary, Luedde, Ewing, Mosher, Gallaher, Goldschmidt - Osmund, Warlow, Cutler, Benedict, Lillie, Skillern, Beck, Harmon Smith, Cushing, Haskin, Hurley, and others.

From a review of this vast literature, and from personal observation, I have been impressed with certain fundamental outstanding points, which will be elaborated in the course of the paper and give us common ground for discussion.

One should constantly keep in mind the difference between the suppurative and non-suppurative character of nasal pathology productive of eye lesions. Neglect of this has resulted in much unfortunate confusion in the past, as evidenced by the following statement in an article published last year by Bordley in the *Archives of Ophthalmology:*

"To depend solely upon intranasal inspection is folly—more frequently one would be misled than helped. There are but three reliable indications of sinus disease to be elicited by such an investigation: pus, polypi, and necrotic bone; and they are more frequently visually absent than present."

The author of this statement is correct in so far as he goes, but he has in mind only the suppurative type of nasal pathology. He ignores entirely the non-suppurative which is productive of eye lesions which are as serious as those produced by the suppurative type of nasal disease.

On these two types of nasal disease we have two classics, namely, Hajek's work on the suppurative diseases of the nasal sinuses, and Sluder's on the non-suppurative diseases. These texts form the keystone in the arch of our knowledge of the subjects outlined. Since their publication the authors have not found it necessary to retract a single basic statement advanced by them.

Progress and advancement in our knowledge of the relation of nasal to eye diseases have been brought about largely through a close cooperation between the internist, neurologist, radiographer, the ophthalmologist and rhinologist, and I would here make a plea for even a closer cooperation in the future than has existed in the past. Such a harmonious association would result in a dissemination of special knowledge to all the participants, and redound to the ultimate advantage of all concerned, including the patient.

The type of eye lesion of nasal origin which has been most commonly reported and discussed is that of the optic nerve, including choked disc, papillitis, atrophy and retrobulbar neuritis. Eye diseases less frequently observed are those involving the choroid, retina, iris, ciliary body, cornea, sclera and extrinsic muscles of the eye. These latter have been perhaps associated more frequently with the non-suppurative type of nasal pathology, and their importance is becoming more apparent as our ability in the diagnosis of the non-suppurative type of nasal disease increases.

Lues, arteriosclerosis, nephritis, diabetes, tuberculosis and focal infection have been in the past the main etiological factors in the production of the eye lesions enumerated. To this list must be added

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both the suppurative and non-suppurative nasal disease. Such nasal disease may be coexistent with the other etiological factors so that in the future multiple causes must be considered as taking the place of the single etiological factor formerly accepted.

We cannot longer afford to be satisfied when a possible single cause for an eye lesion has been found, and this becomes of especial importance when treatment based on such a single cause fails to produce adequate and prompt results. There exists a "wheels within wheels" phase of these etiological factors in that the patient can have a sinus disease caused by lues, tuberculosis, toxins or focal infection, so that these diseases are not the direct cause of the eye lesion but the indirect, whereas the sinus infection is the direct cause.

Confirmative reports are in abundance to warrant one in formulating the rule that in all eye lesions one should be ever mindful of the nasal sinuses, and this becomes of the greatest importance in those eye diseases of obscure origin. Repeated examinations are often necessary before a diagnosis of sinus disease can be established or eliminated.

Those who were fortunate enough to hear Dr. van der Hoeve, of Leiden, Holland, last year at the meeting of the American Academy of Ophthalmology and Otolaryngology could not fail to have been greatly impressed by two statements which he made bearing on the subject of this paper.

"The ophthalmologist has in the eye no sign at all to distinguish the origin of a retrobulbar neuritis; the rhinologist cannot say with absolute certainty that a person has no sinus affection."

These two statements cover a vast territory and are axiomatic.

One must not forget the relationship existing between the pituitary and sphenoid, and one must not be too quick to interpret good results from changes in visual fields following operative manipulation in the sphenoid area as indicative of sphenoid disease alone, as pointed out by Benedict and Lillie. Bleeding and changes in lymph current may result in temporary improvement in the visual fields of pituitary cases, both intra- and extra-sella.

Much divergence of opinion exists at the present time regarding the pathologic mechanism which is active in the production of eye lesions of nasal origin. A majority of the cases reported in the literature are discussed more along clinical than histopathological lines. Lack of pathological confirmation is more than overbalanced by an abundance of clinical material and results.

So far as I have been able to determine, the most comprehensive histopathological reports existent are those of Jonathan Wright obtained first from a study of Sluder's specimens, and later those of White. Wright states that it is sometimes difficult to draw a distinction between the phenomena of physiological and pathological changes in nasal tissues, and this is made more difficult for the general pathologist because of the ravage produced in the process of ridding the tissues under examination of the bone salts to allow sectioning. Absorption of the bone salts is a part of the pathological process in hyperplasia of the sinus walls, and this adds difficulty in the interpretation of the line between pathological and technical alterations in the tissues.

Wright's description of the pathological change occurring in the bone and mucous membrane is given in his text book and in the introduction to Sluder's text, "Headaches and Eye Disorders of Nasal Origin," and at the risk of repetition I wish to recall a few of the most important features mentioned. He speaks of the chronic inflammatory changes to which the nasal structures are subject, as due to the substitution of the stimulus of irritation, whether from external surface agents, from bacterial agents of disease within the surface, or from systemic vasomotor disorders, for that mysterious physiological stimulus of growth which carries with it some agency which shapes the symmetry of form. In this substitution, the agent which shapes the symmetry of form is absent or works badly to produce asymmetrical development in the hyperplastic, irregular and purposeless cavities in the rarefying bone changes, or osteitis.

Wright's conception of the nature of the metabolic processes of bone in healthy and diseased nasal structures is given in several drawings illustrating the building-up process of bone by osteoblasts and the ab-

sorption process by osteoclasts with a transition stage between. With the change in cell form of osteoblast to that of osteoclast there results a reversal of metabolism. The multinuclear osteoclast is usually formed by a fusion of several adjoining mononuclear osteoblasts, but the osteoclast may occasionally be formed by multiplication or proliferation of nuclei in a single cell. This bone process is inaugurated as a sequence of an ordinary hyperplasia of the mucous membrane of the turbinate bodies or lining membrane of the sinuses. These bony changes may be found in almost any nose, but whether or not they give rise to symptoms of an annoying or distressing character depends entirely upon their location; so that the specificity of pathological activity is not so important as the specificity of its locality. The skulls showing abnormal development of the nasal sinuses exhibited by Schaeffer at the American Medical Association meeting in Boston, in 1921, readily demonstrate how variable this specificity of locality may become.

Along the same line one conversant with Wittmaack's work on the pneumatization of the temporal bone cannot help making a conjecture on the possible parallel analogous relations existing between pneumatization of the temporal bone and nasal sinuses and their influence on pathological conditions. Delayed or arrested pneumatization in the nasal sinuses occurring in the first few years of life may exert a hitherto unsuspected influence upon pathological changes occurring in later life.

Besides hyperplasia, with or without periostitis, as an explanation of the pathological mechanism at work in these eye lesions, edema, pressure, toxins, inflammation and congestion are mentioned.

It has appeared to the writer that too many inconclusive terms have been used in the past of the nature of "Mother Hubbard" remarks which cover a vast deal but touch nothing. Physics and pathology have been confused. The use of the word pressure should be qualified. For example, to speak of pressure in the attic of the nose; pressure of middle and superior turbinates; or pressure between the septum and posterior ends of the turbinates, means so little that the term loses its effect on logically reasoning minds. Simple mechanical pressure such as is exerted by a sphenoidal mucocele, and pressure of inflammatory products under tension, involve widely different pathological mechanisms. If the word pressure is to be retained it would perhaps be best used as a designation for simple mechanical pressure.

In a paper before this Section last year Sluder reported three anatomical, clinical and pathological observations bearing upon the etiological association between the nose and eye lesions. The first was by Uffenorde dealing with the anatomical condition of vessels communicating between the membrane of the sphenoidal sinus and the optic sheath in the optic canal. The second was by Sluder himself in a case of serous iritis presumably secondary to a sphenoiditis where in the sphenoid he observed a lesion upon the optic canal showing blood vessels converging to meet at its center. The epithelium was greatly thickened at the center, of a dirty gray color and gradually faded into the normal at a distance of half a centimeter. The third was by de Klein and Gerlach, who at autopsy demonstrated an encapsulated diplococcus in the secretion and membrane of the sphenoid and the optic sheath in the optic canal and also in the optic nerve.

To these I desire to add a fourth observation, in Case I (Mrs. F. A.), reported at the close of this paper. During the removal of the anterior sphenoid wall and posterior ethmoid cells by the Sluder technic it was noticed that a large mass of hyperplastic tissue had eroded its way into the sphenoid cavity through the anterior wall of the sphenoid. This mass was dumb-bell shaped and came away with a large portion of the anterior wall of the sphenoid encircling the constricted portion of the hyperplastic mass. This gave a free view into the sphenoid. At the upper outer angle of the sphenoid along the course of the optic canal a hyperplastic mass irregular in shape and about one centimeter in diameter with thickened epithelium and irregular macroscopic vessels on its surface presented itself to view. Careful probing around its base and pedicle failed to elicit any necrotic bone. It was seized carefully with forceps, in one

of those moments that try the operator's soul, and was removed without any apparent injury to the district of the optic canal or cavernous sinus. Pathological examination of the tissue showed chronic inflammation.

The diagnosis of eye lesions of nasal origin involves many problems for the examiner. The importance of single and multiple etiological entities has already been mentioned. After routine medical, neurological, dental, serological and roentgen ray examinations have been completed without arriving at any definite conclusion, it frequently falls to the lot of the rhinologist to make and complete the diagnostic picture. He can seek aid from the fundus and perimetric examinations of the ophthalmologist when such are obtainable, and from the radiographer when roentgen ray interpretations can be properly evaluated. Such conditions do not, unfortunately, always obtain. Anterior and median rhinoscopy and the use of the nasopharyngoscope may offer assistance, but the sheet anchor of diagnosis, if such may be said to exist, lies in posterior rhinoscopy. This method, I fear, is too often neglected, or, when used, is perfunctorily done because of improper illumination and failure to recognize slight departures from the normal in the membrane and structures in the post-ethmosphenoidal district is the result.

Sluder has given us the best description of the normal post-ethmosphenoidal district and the variations in this region which may be interpreted as diagnostic factors in determining eye lesions to be of nasal origin. I would refer you to his text for the details. In general one must translate and interpret the color, thickness and translucency of the epithelium and membrane of the olfactory fissure and the character of its vascularity, smoothness and secretion. The size and character of the plica septi and posterior tip of the middle turbinate, which may be considered as forming the lower boundary of this district, should be emphasized. A consideration of the wiping action of the soft palate is of paramount importance. In small and medium-sized pharynges it often becomes necessary to recognize secretion anterior to the choanal plane, and here obliquely illuminated thickened epithelium on the edges of convexities and concavities must be differentiated from purulent secretion. This differentiation becomes of the greatest importance at the upper choanal arc. Proper differentiation can only be accomplished by proper illumination and repeated examination.

The best form of illumination is direct sunlight. This is not always available and must be employed with the concave mirror more or less out of focus, because if focussed, the light becomes too hot to be borne by the patient. Even when used with the head mirror out of focus there is apt to be too much glare and important details are obscured. The arc lamp offers a white, bright light free from disproportionate excess of reds, greens and yellows and is a satisfactory substitute for sunlight. Lights containing greens, reds and yellows interfere with a correct estimate of the color of the membrane and the thickness and opacity of its epithelium. The lights used by most rhinologists are unsuited for proper posterior rhinoscopy both from the standpoint of insufficient brilliance and whiteness. When compared to the arc lamp they are, to use the words of the Arkansas Senator, "As the puny light in the tail of a lightning bug to the glorious effulgence of the noonday sun."

The examination of the visual field often assists materially when it can be made. The most frequent loss of function appears in the peripapillary and central fibers producing, respectively, an enlargement of the blind spot, and central scotoma. Just why this occurs we do not know, but we are forced to accept it as a fact. Both types of scotoma are at first relative for colors, and later, perhaps, for form. There may be combinations of the two types when, by enlargement of one or the other, fusion occurs and produces the well known oval scotoma including and surrounding the fixation point as well as the blind spot. The enlargement of the blind spot is the more frequently observed, but an enlargement of a central scotoma can extend until it fuses with the blind spot to form the oval scotoma. When such an oval scotoma is present its method of development cannot be determined. As the symptom subsides repeated examina-

tions of the central field may give us data upon which the method of its development may be conjectured. When such symptoms are found the nasal origin must be determined by exclusion of other causes, such as high myopia, medullated nerve fibers, hysteria, degeneration or hemorrhage into the macula, chemical intoxications, glaucoma, multiple sclerosis, tuberculosis, lues, focal infection, new growths, etc.

Roentgenograms of the nasal sinuses may at times assist us in the diagnosis of sinus disease, but their interpretation is beset with many difficulties. Stereoscopic plates of the sharpest possible definition, presenting direct comparison of symmetrical parts, with projection of the structures at the base of the skull, especially the petrous portions of the temporals and the cervical spine, producing confusing shadows, into areas where their shadows will dovetail with known structures, without serious overlapping of these shadows, offer us the best opportunity to determine the character of the disease in the sinuses, namely, whether it is suppurative, nonsuppurative, or new growth formation. We can further depend upon the roentgenogram to determine the presence or absence of a sinus and its shape and size, but not always the nature of its contents. The x-ray is often disappointing and unreliable in the diagnosis of mucocele and the nonsuppurative type of sinus disease.

Van der Hoeve calls attention to nine cases of mucocele of the sphenoid not shown by the radiograph but diagnosed by exploratory operation upon the sphenoid. The method adopted by the late van Zwaluwenburg, of the University Hospital at Ann Arbor, Mich., and elaborated by Canfield at the recent Academy meeting in Minneapolis, accomplishes more nearly perhaps than any other the ideal of the radiographer, namely, the diagnosis of the character of sinus disease. On the whole, roentgenograms have been in general more or less disappointing, and many observers have gained little from their application. To express it in the form of a Hibernicism, "They have often led to the diagnosis of sinus disease where no disease existed, resulting in operations made in good faith but with bad judgment." Where good results have been forthcoming they have developed from a sympathetic relationship between the rhinologist and radiographer, both able to so interpret the plates as to adjust their differences of opinion and explain their differences of observation. Many of the points already mentioned show how such conditions as lues, albuminuria, diabetes, arteriosclerosis, brain lesions, focal infection, tuberculosis, multiple sclerosis, etc., can confuse nasal examination. They should give the rhinologist opportunity to investigate thoroughly, and repeated examinations will often determine slight changes readily overlooked in conditions which at first sight are not obvious post-ethmoid or sphenoid cases. All of this emphasizes again the small changes which may be responsible for ocular lesions.

In considering prognosis we must distinguish between the reparable affections which may exist even for months and the irreparable ones leading to degeneration and atrophy. We need a better insight into the manner in which nasal disease involves the ocular structures, and this can only be obtained from autopsy material, which is rare, as these cases are seldom fatal; and histological and bacteriological examinations of specimens removed at operation. Prognosis depends in general upon early diagnosis followed by complete and comprehensive operation where treatment does not produce rapid results.

The following case histories illustrate a few of the various types of eye lesions which I have encountered:

Case I.—Mrs. F. R., an American housewife, aged sixty years, consulted me November 12, 1920, suffering from a uveitis of the left eye which began in February, 1920. Nothing relevant was elicited from her family or past history. Her trouble developed gradually without pain and with gradual loss of sight. She had been in various competent hands since April, 1920.

General physical examination in a diagnostic clinic revealed a possible cholecystitis which was not considered by the surgeons to be sufficient for operation. Roentgen ray examination of the chest, stomach and intestinal tract was negative. One urine examination showed a few pus cells, but two days later a catheterized specimen was negative for pus. The patient had phthalein 35 per cent. Her teeth were removed with the exception of one root, which was negative in the roentgenogram. The tonsils were atrophied. The nose was reported negative except for a vestibulitis, worse on the left side. The Wassermann, both blood and spinal fluid, was negative.

Examination of the left eye showed the posterior surface of the cornea completely covered with a diffuse, grayish deposit, giving the whole cornea and anterior chamber a cloudy appearance. The iris was muddy and the outline of the pupil could hardly be seen. No fundus details were obtainable. Light perception and projection were absent. Finger tension was equal in both eyes. Vision O. D. with correction, plus 0.50 S. ⌒ minus 1.00 C. axis 80 was 20/30. She was using dionin and atropin locally in the left eye and taking potassium iodid internally.

Examination of the nose revealed a left-sided hyperplastic post-ethmosphenoiditis.

During the meeting of this Association in Louisville, in November, 1920, the patient was seen by Drs. J. C. Beck, of Chicago, and M. F. Arbuckle, of St. Louis, who concurred in the diagnosis. Puncture and washing of both antra relieved the vestibulitis. The patient refused operation and left.

She returned January 24, 1921, and was operated upon January 27, 1921. The Sluder upper cell operation was done under cocain block anesthesia. High cribiform middle turbinectomy was first done. The posterior insertion of the middle turbinate was well bowed into the nose, producing a sort of downward continuation of the sphenoethmoidal recess. In this recess there was a large mass of hyperplastic polypoid tissue which had eroded an opening into the anterior wall of the sphenoid, into which it protruded as a dumb-bell shaped mass. The mass came away with a large portion of the anterior wall of the sphenoid encircling it at its constricted middle. This gave a free view into the sphenoid. At the upper outer angle of the sphenoid along the course of the optic canal a hyperplastic mass irregularly about one centimeter in diameter with thickened epithelium and irregular macroscopic vessels on its surface presented to view. This was removed carefully with forceps. Post-operative pain was controlled with aspirin, as the patient could not take opium derivatives.

February 4, 1921.—The spots on the posterior surface of the cornea and anterior surface of the lens were fewer in number and discrete. Atropin and dionin were continued. Light perception and projection were present.

March 17, 1921.—Only a few discrete deposits remained on the posterior surface of the cornea and anterior capsule of the lens. The vitreos was full of large and small floating opacities and details of the fundus could occasionally be seen.

May 19, 1921.—The patient reads 20/100 to 20/70 with her left eye. All deposits in the anterior chamber were gone. The vitreos opacities were rapidly disappearing. The operated area had healed satisfactorily and was well ventilated and drained. Fundus details were visible.

August 31, 1921.—Vision with the left eye with correction 20/30. A few floaters were still in the vitreos.

This case was especially interesting because of the long interval existing between its inception and diagnosis and operation of the etiological factor with return of almost normal vision after loss of light perception and projection for several months.

The following case is reported to show the effect of a low grade hyperplastic sphenoethmoiditis on the accommodation.

Case II.—Mr. W. S. F., an American publisher, aged sixty, consulted me, stating that glasses which he had obtained three weeks previously from a local oculist were unsatisfactory, especially the right lens. He was wearing Kryptoks, O. D. plus 2.00 S. ⌒ plus 0.25 C. x 90. O. S. plus 1.75. Reading add plus 3.00. O. U. vision without correction, O. D. 20/200, O. S. 20/50. With my examination he accepted: O. D. plus 3.00 S. ⌒ plus 2.50 C. x 130. O. S. plus 2.00 S. ⌒ plus 0.50 C. x 10. Reading add plus 2.00 O. U. V. O. U. with correction 20/20. Examination of the fundus was negative.

The next day he returned after obtaining his glasses, stating that his distant vision with his glasses was blurred. Re-examination developed best vision with right eye from the following: plus 2.00 S. ⌒ plus 2.00 C. x 130. A few days later this lens for the right eye was unsatisfactory. Visual fields were negative and tension was normal. General neurological serological, roentgen ray and dental examinations were reported negative. Treatment directed toward a right-sided, low grade, post-ethmosphenoiditis quieted the irritable ciliary muscle and the right eye went into proper function.

The following case is reported to show how cocainization of the nasal ganglion relieved the pain of a herpes ophthalmicus which did not yield to opium derivatives:

Case III.—Mrs. M. G., an American housewife, aged thirty-four, consulted me August 7, 1921, suffering great pain from an extensive herpes ophthalmicus involving the right side of the head, forehead, eyelids and cornea. Hypodermic administration of morphin and codein by mouth had failed to relieve her intense pain. Cocainization of the right nasal ganglion promptly relieved the pain and relief continued for about twenty-two hours, when it recurred and was promptly relieved by the same treatment. This was done for eight successive days, when the pain ceased as the eruption began to dry.

This case illustrates the result of incomplete operative measures in delaying recovery, and emphasizes the necessity of high cribiform middle turbinectomy to assist in favoring drainage and clearing the operative field in order to properly approach anomalous ethmoid cells as emphasized by Sluder.

Case IV.—Mrs. B. B. M., an American widow aged sixty-six years, was seen by me October 24, 1921, complaining chiefly of blurred vision of the right eye of some five weeks' duration. Medical, neurological, dental, serological and x-ray examinations in a search for the etiological factor were

negative, and an exploratory operation had been done on the right posterior ethmoids and sphenoid before she consulted me. Her family history was negative. Past history elicited nothing relevant except that she was susceptible to headaches and acute attacks of rhinitis, and presbyopia had set in at forty years of age. Vision O. D. 20/200, O. S. 20/30 with correction: O. D. plus 0.75 S, O. S. plus 0.50 S. ⌒ plus 0.75 C, axis 175. Reading add plus 2.50 O. U.

Examinations of the right eye were negative except the ophthalmoscopic and perimetric. Perimetric examination developed concentric contraction of fields for colors and forms and enlargement of the blind spot for colors and form. The media were clear. The disc head showed a hemorrhagic neuroretinitis with several cotton-white patches irregularly distributed on the nasal side of the disc. The hemorrhages were small and flame-shaped with general edema of the retina. The vessels were tortuous and well filled, with here and there disappearance in the edematous retina.

Examination of the nose disclosed the right posterior ethmoids partially and the right sphenoid opened. All this area was covered with an abundant purulent discharge. The upper overhang of the right middle turbinate and the superior turbinate were still in position and covered with the same purulent discharge. The right antrum had been punctured and washed and pronounced negative.

Both antra transilluminated well. Under treatment there was little change in the eye condition, although the purulent discharge and edematous tissue in the operated area were greatly diminished.

On December 9, 1921, the Sluder operation under block anesthesia was done on the right ethmoids and sphenoid. The anterior and middle ethmoids were ventilated and drained, after removal of the upper overhang of the middle turbinate, which was left by the previous operator. There were many synechiae between this stump and the septum and between it and the ethmoid capsule. After this was removed a bulging of the ethmoid capsule high up and posteriorly was noticed. The sphenoid knife was carefully introduced, and an ethmosphenoid cell slightly larger than a pea was opened, which was filled with thickened hyperplastic tissue and a thin colorless secretion. The patient had experienced no pain whatever until the time of opening this cell. After this anomalous cell was opened she complained of considerable pain on the right side of the head. As the sphenoid had been opened by the previous operator, and it appeared to be draining well and ventilated, it was not disturbed.

Improvement was rapid, so that within a month the hemorrhages in the right retina were practically absorbed. The nasal discharge soon ceased, and the patient was discharged March 25, 1922, with the retina clear and vision of the right eye 20/50.

This case proved beyond the question of a doubt the superiority of the Sluder operation, as any other technic would have failed to reach the anomalous post-ethmoid cell.

This case illustrates how lues diagnosed serologically may confuse diagnosis of the etiological factor in retrobulbar neuritis of rapid onset.

Case V.—Mrs. D. S., American widow aged twenty-three, was first seen by me November 20, 1919, complaining of blindness of the left eye, associated with severe pain in the left side of the head of several days' duration. Family history was negative. Nothing of importance was obtained from her past history, except that for the past six years she had at intervals suffered attacks of severe pain in the back of the head and neck, and in April and June, 1919, she had contracted influenza. Since the last attack in June, 1919, she had not been well.

Medical, neurological, dental and x-ray examinations were negative. Wassermann was reported two plus.

Vision O. D. 20/200. With correction —2.00 C, axis 140 V. 20/70. O. S. Doubtful light perception.

Examination of external eye, media and fundi negative except for slight blurring of edges of left disc and slight dilatation of left pupil, which did not respond to direct light, but reacted slightly to consensual light and accommodation.

Examination of the nose showed a hyperplastic post-ethmosphenoiditis, bilateral.

Adequate antispecific treatment produced no results, so on November 27, 1919, the postethmoids and sphenoid on the left side were operated by the Sluder method, with a rapid and prompt recovery.

A pathological diagnosis of chronic inflammation was reported from an examination of the tissue removed.

On December 4, 1919, the patient could see well.

Discharged January 8, 1920, with vision of the left eye 20/40 with correction plus 2.00, axis 120.

This is another case of possible multiple etiology which cleared up under nasal treatment alone, after running a course of four months with only local eye treatment and entire neglect of the nasal factor.

Case VI.—Mr. R. V. K., Canadian turfman, aged thirty-three years, was brought to me April 8, 1922, in a highly nervous state after an attempt at suicide as a result of being told by a colleague that everything possible had been done for his eye and that he would be blind.

His family and past history were negative.

Early in January, 1922, lachrymation of both eyes began. About a week later vision in the left eye became blurred and the "centers of things appeared punched out and black." His eye did not become red, and he suffered only occasional twinges of pain about and in the eye. Wassermann and urine examinations had been reported negative by his oculist. He had been given medicines, one of which "enlarged his pupil," and the other would make his eye "very red"—probably atropin and dionin.

The anterior segment of the left eye was negative except for an irregular left pupil and several posterior synechiae.

The pupils reacted to light and accommodation. Ophthalmoscopic examination was negative. Vision O. D. 20/20, O. S. 20/70.

Perimetric examination showed concentric contraction of the left field for form and colors with enlargement of the blind spot for form and colors, and an absolute central scotoma about two degrees in diameter.

Medical, neurological, serological and x-ray examinations were negative.

Dental examination showed the left upper second lateral incisor impacted and unerupted with large apical rarefaction of the second lower left molar.

Examination of the nose showed by posterior rhinoscopy a thin stream of white pus coming down the anterior face of the left sphenoid.

The patient began to improve under treatment directed to the purulent sphenoiditis, and did not have his infected and impacted teeth extracted.

He was dicharged June 5, 1922, with vision of left eye 20/20—. and again urged on general principles to have his diseased teeth extracted.

The presence of the posterior synechiae brings up the question of possible single or multiple etiology.

The rapid recovery of vision after treatment directed to the purulent sinusitis was instituted gives the case the appearance of being of strictly nasal origin.

CONCLUSIONS

(1) In all eye lesions one must be mindful of the nasal sinuses as a possible etiology.

(2) Repeated careful examinations with proper illumination are often necessary to disclose small, easily overlooked changes in the post-ethmosphenoidal region which may be productive of ocular lesions.

(3) Sluder's careful clinical descriptions, coupled with Wright's histopathological diagnoses, based upon Sluder's specimens removed at operation, offer the most practical approach to the study of eye lesions of nasal origin.

(4) Early differential diagnosis and complete comprehensive operation when treatment fails to produce rapid results are of great importance in the prognosis of ocular lesions of nasal origin.

(5) More qualified use of the word "pressure" is needed in the literature dealing with eye lesions of nasal origin.

(6) Closer intensive group study is necessary if progress is to continue.

Francis Building.

DISCUSSION

Dr. W. T. Patton, New Orleans, La.—There is a tendency among some eye men, when they find tuberculosis, albuminuria, sugar, etc., to treat the case simply for the albuminuria, sugar, or tuberculosis. The main trouble often is in the infection in the sinuses.

In old age, lesions of the eye may be caused by degenerative changes of the macular region due to arteriosclerosis, but quite often they are due to toxemia or to disease of the posterior sinuses. Opening the sinuses will improve the condition. Sugar may be secondary to a sinus condition. It has also been proven that irritation of the posterior lobe of the pituitary can cause sugar in the urine, and that disease of the sphenoid, irritating the posterior lobe of the pituitary, will also cause the same condition. Several cases have been reported where opening the sphenoid has cured both the sugar and the eye conditions.

If the ophthalmologist finds eye symptoms which the ophthalmoscope cannot account for, and in which the muscles are not affected, there should certainly be repeated examinations by an ear, nose and throat man. Dr. Sluder has proven that in a number of cases. He spends hours before he makes a diagnosis of sphenoid in this condition. A parapapillary scotoma is usually due to sinus trouble, provided in the other eye muscle conditions have been ruled out. We have symptoms of sinus involvement, pain, slight enlargement of the pupil, and scotoma even before the ophthalmoscope shows any symptoms of glaucoma. In disseminated sclerosis the blind spot is not enlarged. The paracentral scotoma may be visible in a pituitary condition, and again the blind spot is not enlarged.

Before operating upon any of these cases, we should certainly have them carefully examined by the internist, ophthalmologist, serologist, roentgenologist, and last but not least, the dentist. Then the responsibility should rest equally upon the ophthalmologist and the rhinologist.

The blind spot should be measured in all cases where the symptoms are due to eye strain. Also small central or paracentral scotomas should be sought for. In any case that has been diagnosed as a possible sphenoid or posterior ethmoid, if after irrigation and suction and shrinking with cocain, the condition does not improve, we should operate. Acute threatening cases should be operated upon at once. The prognosis depends upon how early we operate. If a case has been going on for six weeks, there may be so much atrophy that operation will do no good. In cases where we have pus, or necrosis of the bone, it is easy to make a diagnosis; but where the sclerosis has gone on for some time the diagnosis is sometimes difficult.

Dr. Harold Bailey, Springfield, Mo.—Certain cases of chronic phlyctenular inflammation, either of the cornea or conjunctiva, which resist treatment for a long time, will clear up after the removal of adenoids.

While doing an expression operation for trachoma in children, it is well at the same time to remove any existing adenoids. I have frequently

noticed in the treatment of trachoma in the adult, when improvement reaches a certain stage and goes no farther, that an examination of the nose may reveal additional pathology which seems to aggravate the trachoma.

Mild cases of epiphora and nasal duct obstruction can many times be cured by trimming the anterior end of the corresponding lower turbinate. Sometimes by fracturing the turbinate toward the septum the pressure on the outlet to the nasal duct is relieved.

Dr. Arthur I. Weil, New Orleans, La.—One of my confreres recently said to me: "I can understand how a man can practice otolaryngology without a great deal of knowledge of the eye, but I cannot understand how a man can practice ophthalmology without a thorough understanding of the nose." That is perfectly true, unless the ophthalmologist is willing to send all cases where there is the slightest suspicion of nasal involvement to the nose and throat man. A note of conservatism, however, should be sounded against operating upon all these cases, whether there is pathology present or not, on the chance of getting good results. The diagnosis is difficult, and sometimes impossible where we have no objective signs, but in bone lesions where the hyperplasia extends into the nose the diagnosis is easy enough.

A week ago a case came in to the hospital with sudden blindness in the left eye. This patient had been seen in the clinic for some time and a possible diagnosis of lues had been made. X-ray examination showed some haziness in the posterior ethmoid and sphenoid on that side. He suddenly became blind in the left eye and the natural tendency was to operate immediately upon the posterior ethmoid and sphenoid. But we waited long enough to get an opinion from a competent ophthalmologist and a competent neurologist. The fields were much diminished, but there was no scotoma. The ophthalmologist advised delay in operating upon the nose and is inclined to think there is a tumor at the apex of the orbit. The neurologist is inclined to think there is a tumor in the brain. I mention the case to show how we might have operated upon the nose when the trouble probably is in the orbit or in the brain.

Dr. M. F. Arbuckle, St. Louis, Mo.—We cannot be too careful in studying these cases.

Dr. Bailey mentioned the procedure of removing the anterior end of the lower turbinate. While of course it is at times necessary to do something with the anterior end of the lower turbinate, we should be very careful in surgery of the lower turbinate.

The first thing essential in making a diagnosis of disease in the olfactory region is to examine under proper light. The only light which is fit for post-nasal examination is an arc light. I have tried all the other electric lights that I have been able to lay hands on, and without proper light nasal examination is useless. Furthermore, without proper post-nasal examination in these cases an opinion as to whether or not the cause of an eye lesion lies in the nose is worthless.

In examining the nose for any disease of the sinuses, especially the upper cells, it is important to remember that we do not have to find a lot of pus, also that a suppurative process may be present without being demonstrable at the time of the examination. Very often, repeated examinations are required to demonstrate suppuration. On the other hand, if an inflammatory process is present, there are nearly always sufficient inflammatory changes evident to enable us to make a diagnosis of an inflammatory process.

The use of the x-ray in the study of sinus disease is indispensable to make out the size of the sinus and the contour. When it comes to deciding the fluid content of the sinuses the x-ray is as yet of very questionable value.

Dr. E. H. Cary, Dallas, Tex.—I want to report a case in which we did an autopsy, of a very large man, with a history of dilated pupils, loss of accommodation, and iritis. After examination it was impossible to determine that there was any trouble with his sinuses. We could not see any secretion anywhere. He had a meningitis and died and we did an autopsy, which showed what was apparently an encapsulated abscess within the sphenoidal cavity. Just where the third nerve passed beneath the optic nerve there was enough involvement of the bone to catch the third nerve. The third nerve paralysis was accounted for by that sphenoidal infection, and that brought about a streptococcic meningitis which killed the patient. It is the only case of the kind I have seen. There we had something that we could not bring out clinically that actually was producing an erosion by contact.

Dr. John J. Shea, Memphis, Tenn.—Dr. Heitger referred to the work of Wittmaack on the pneumatization of the temporal bone. This same process can occur in the spheno-ethmoidal labyrinth. When it does occur, any infection will more rapidly become chronic.

Dr. Ellett reported before the American Medical Association at New Orleans, in 1920, the case of a woman who had lost her vision completely. There was not even light preception. The cause of her optic neuritis was a pan-sinusitis. After a complete exenteration of her ethmoids and a resection of the anterior wall of the sphenoid, her vision rapidly returned to 15/15 and has remained so for three years. I have had another case in which the vision was diminished to 10/200, due to a cyst of the left ethmoid. After exenteration of the cyst the vision returned to normal and has remained so for eighteen months. In these two cases we were able to demonstrate gross pathological changes in the eye and the sinuses.

Dr. Weiner brought before us at the Louisville meeting the work of Loeb on the ethmoid in relation to the optic nerve, and brought out that it was the last posterior ethmoid cell or sphenoid cell that really did the damage. After that we began the procedure of resecting the anterior wall of the sphenoid first, and then entering the last ethmoid cell. By exenterating the ethmoid cells from behind forward, and from above downward, we are able to do the dangerous resection in a clear field.

THE TECHNIC OF A RADICAL MASTOID*

By Frederick Emerson Hasty, M.D.,
Nashville, Tenn.

To the patient and the family physician there are at least two important phases of radical mastoid surgery. The first is to determine when the patient has reached the stage where a radical mastoid exenteration must be done. The radical mastoid has been done, or attempted, in many cases where a more simple procedure would have sufficed. Later, I hope to report upon a type of operation that is even more conservative than the Heath, and which in a series of several cases has been quite as efficacious.

The second phase concerns the patient's just right to some promise as to the final results of his operation, such as the chances of living, of health, and of the degree of hearing that he can expect to retain. The dangers of the neglected chronic discharging ear are well known, but perhaps not fully appreciated. Along with other evidences of improved health, it is not unusual for an adult to gain from fifteen to twenty pounds after a chronic mastoiditis has been cleared up. I have never found it necessary to do a radical mastoid on an ear that had useful hearing. Nor have I ever seen a case in which a radical mastoid was necessary where useful hearing remained for any considerable length of time after the operation. So in my hands it is a health and life saving procedure. I do not mean to suggest that chronic discharging ears should be neglected in the least, but I would say that they should all be cleared up either by treatment or by the proper surgery for the particular case.

The technic of a radical mastoidectomy entails more delicate features than almost any other one of our modern surgical operations. A thorough knowledge of the normal and pathological surgical anatomy of the parts to be dealt with is essential. Otherwise, the results will often be unsatisfactory and discouraging.

The steps in the actual doing of the operation are as follows: Stand above the head of the patient and begin the incision at a point opposite the external surface of the tip of the mastoid process. Hold the knife so as to give a slightly downward bevel to the flap, thus favoring drainage, and guarding against retention of pus in the lower angle of the cavity. Make the incision to the bone to a point opposite the superior surface of the external bony canal wall, and from here on through the skin only, leaving the temporal muscle intact. Extend the incision from the point of beginning upward and backward to one-fourth inch inside the hair line and let this relation continue to a point opposite the superior attachment of the ear.

Now carefully elevate the periosteum in the lower part of the incision toward the ear, but throughout the operation rigidly avoid the elevation of the soft tissues posterior to the incision, except to remove pathological tissue. Next, dissect the overlying tissue from the temporal muscle, which is left intact to prevent the caving-in deformity. I do not use mouth-toothed retractors of any type. They macerate the margins of the wound and bury infection in the soft tissues, thus tending to cause erysipelas, sloughing, etc.

With large hemostats grasp the periosteum at points opposite the superior canal wall and the lower attachment of the ear, and by pulling rather firmly on these produce a good exposure of the operative field. Practically all of the hemorrhage may be controlled by the folding of the flap. It is not advisable in all cases to attempt to separate all of the membranous canal in the first stage of the operation, since it often happens that the bony canal is so irregular as to make it almost impossible to separate the membrane without tearing it. In such cases, it is better to separate the membrane as the bony canal is being removed. I have purposely not advised the separation of the sternocleidomastoid muscle. It should not be molested unless existing pathology makes it necessary. This precaution very markedly decreases the chances of neck infection, and

*Read in the Section on Eye, Ear, Nose and Throat, Southern Medical Association, Sixteenth Annual Meeting, Chattanooga, Tenn., Nov. 13-16, 1922.

saves the patient practically all of the pain and discomfort of a stiff neck.

In the majority of cases, the quickest and safest way of reaching the antrum is according to the method suggested by Richards; i. e., begin by removing the posterior, superior bony canal wall, extending this excavation for a reasonable distance upward and back toward the sinus. After the cells or the pathological tissues that are always found in the region of the antrum are reached, discard the chisel or gouge for the curet, and now open the antrum and enlarge it, thus leaving a thin shallow rim of the bony canal wall. Then remove this by placing a number one sized Spratt curet in the antrum, having the cutting side against the rim of the bone and using the upper bony edge of the wound as a fulcrum. By rocking the curet from side to side, cut away a small section of the rim. This turns the antrum, the middle ear, and the bony canal into one cavity.

From now on it is the surgeon's aim to remove all diseased tissue from this newly formed cavity and to make all of its surfaces continuous, and as nearly as possible, regular and smooth. Enlarge the cavity according to a method which will lend the greatest degree of safety possible to the important structures which lie near the finished walls. There are two very important points by way of precaution in the technic of radical mastoid surgery. One is to keep the operative field absolutely clear of blood. The other is to avoid twisting or scrubbing with the sponge in the middle ear as the stapes can be easily dislocated in this way.

With a rather small Richards curet, remove the remains of the superior bony canal wall, or as it is sometimes called, the external wall of the tympanum. The dura in the middle fossa may come rather low in this region, and while one would not minimize the gravity of exposing the dura in a contaminated wound it does seem that the dura of the middle fossa offers a wonderful resistance to infection. Considerable time can be saved by keeping the middle ear packed with gauze saturated in adrenalin. Besides controlling the hemorrhage, this catches the small chips of bone. Remove the packing from time to time in order to study the landmarks.

It is well, now, to lower the facial ridge with a Richards straight curet, again using the upper bony edge of the wound for a fulcrum. Set the sharp edge to cut off a very thin shaving, and with a continuous guarded stroke, cut this shaving all the way out of the ridge, clean the curet and very carefully inspect the surface before cutting another shaving. The ridge can be safely lowered in this way at least to a level with the bony capsule of the external semi-circular canal. A certain amount of overhang in the region of the stapes should be removed, but the head of the stapes must not be caught in the bowl of the curet.

This method, if absolutely observed, makes it possible to lower the facial ridge to the greatest degree with the maximum of safety, for the following reasons. The external semi-circular canal is a land mark sure to be safe of the plane parallel to the external surface of the nerve, and the most posterior surface of the external bony canal wall is clear of the nerve. A few surgical, anatomical, and pathological facts are apropos at this point. It should be appreciated that we are here dealing with a ledge of bone which is made up of bone tissue that has a consistency of at least three or four different degrees. The plate of the bony canal wall, if not destroyed by cholesteatoma, is hard and brittle. Cholesteatoma in this region has a marked tendency to expose the facial nerve. If one is not on the alert, this exposure is not detected until late in the operation, and may not be found at all. Next to the wall plate there are a number of cells which are usually small, but a few large ones are often present and may cause one to lose control of the curet or chisel when they are cut. Just external to the external semi-circular canal there are often one or two small vessels frequently surrounded by two or three large cells. These make a weak point, so to speak, and as a result the nerve is rather vulnerable at this place. It is not so much that it will be severed, but that its wall is thin and dense and can respond to pressure in only one of two ways. It may either wholly resist it or be crushed and the fragments may be buried in the nerve,

thus resulting in swelling, infection, necrosis of the fragments, and a permanent paralysis that the surgeon may never be able to explain. To reflect a moment, the technic as outlined allows all cutting to be done on a plane practically parallel with the nerve, and if the curet is held under control, a crushing injury will not happen.

If the ossicles are in view, remove their remains with a thumb forceps, preferably pulling from behind forward, but not fishing for them in blood or granulation tissue. Now cut flush the anterior canal wall. A small exposure of the jaw joint seldom causes trouble, while irregularities in the canal wall obstruct the view of the mouth of the eustachian tube.

It is well now first to insert a probe or a very small Spratt curet, and to determine the depth of the tube to the isthmus, and the consistency of the walls. If the main part of the pathology is found in the middle ear, the membrane and bony walls of the tube will likely be quite involved. On the other hand, it may be that there is very slight change of these structures in cases where the cholesteatomous degeneration is in the mastoid proper.

It seems that otologic surgeons have, perhaps unconsciously, been prone to incriminate the eustachian tube in almost every unsuccessful result. The tube *per se* is only the cause of a persistent discharge in those cases where the surgeon fails to do complete surgery and to give the proper post-operative attention. Remove all soft tissue, either bone or mucous membrane from the mouth of the tube, obliterate the anulus and remove also the processus cochlearis and the tensor tympani muscle. We may profitably make a more analytical study of some of the causes of a discharge into the cavity that may be incorrectly credited to the tube, such as chronic paranasal sinus infection, the whole or parts of adenoids, injuries to torus tubarius, tonsils, etc., and in the mastoid cavity diseased bone that was overlooked at the operation. Frequent locations for this are the anterior root of the zygoma, the outer wall of the tympanum and the cells in the angle between the floor of the middle fossae and the sinus. A contributing cause of the trouble in the above mentioned points is allowing the cavity to fill with a thick layer of granulation tissue, so that when the pus accumulates at these places it cannot rupture through and consequently it gravitates to the apex of the cavity and there emerges, seemingly from the eustachian tube.

With a long straight bistoury not over one-eighth of an inch wide, enter at the highest point of the canal and extend the incision one-sixteenth of an inch external to the crest of the inward curvature of the canal to its lowest point. Bisect this flap so as to let two-thirds be reflected upward by one small catgut suture anchored to the tissues at the posterior superior margin of the cavity. The lower flap may be held in place by sutures or packing. Remove the cartilage and excessive tissue from both flaps.

With silkworm gut, close the entire incision, placing a small drainage in the lower angle for twenty-four hours. Pack the wound from the eustachian tube outward with iodoform gauze. Place a small piece of gauze saturated in alcohol over the line of incision. Put on a large dressing of fluff gauze and wet it with hot boric acid solution. This will prevent swelling and will add a great deal to the comfort of the patient. Cut the sutures at the end of twenty-four to forty-eight hours and remove them twenty-four hours later. Dress daily in the hospital.

DISCUSSION

Dr. John J. Shea, Memphis, Tenn.—Dr. Hasty has described an operation which is very similar to the one of Barany. The latter described his operation for the first time in this country at the meeting of the American Academy in Minneapolis. Both of these operations tend toward the conservation of the membranous canal. This type of radical operation will benefit a chronic discharge and require a shorter period to heal. In doing radical mastoid operations the bone is often sclerotic, either because it is a persistent infantile mastoid, or because of scar tissue from infections.

The use of a burr in our hands has reduced considerably the time required for radical operations.

The terminal cell in any direction is a large cell. At the tip this is of only momentary importance, but when working out cells behind the sinus, this knowledge is very convenient.

The use of paraffin gauze next to the wound will allow you a painless first dressing, which is always dreaded by the patient.

Dr. W. T. Patton, New Orleans, La.—I have always preached against the radical mastoid, because it is a serious operation in the first place, and the after results are quite often not what we hope for. If we can get the cases early, the acute or sub-acute stage, do a simple mastoid, going as far as we care into the attic, very few will come to the radical mastoid. At the end of five or six months after a radical mastoid the hearing is apparently improved; but at the end of a year it is practically abolished in most cases.

The secret of success in a radical mastoid is the absolutely cleaning out of all the disease. If we give the patient fifteen minutes more after we are through, being careful to have a dry field and get absolutely healthy bone, not scrape down the bone until a necrosis is caused, but be sure that every bit of diseased cell and every particle of diseased bone has been removed, it will materially affect our success.

A second point is getting the ridge sufficiently low to bring the two cavities as near together as possible. That is a matter of personal equation, but the more work we do, the further down we go. We cannot use the semi-circular canal as a guide all the way, because although we can start with it, as we go down the nerve comes outward and we must leave a little more ridge lower down than above.

Keeping the wound clean is another important point. We use suction frequently. In removing the ridge just over the facial nerve, I prefer a backbiting forceps, such as the Kerrison. With the curet one is apt to hit the nerve.

The Doctor did not speak of skin grafting. Recently I have tried, in a couple of cases, something recommended by a physician in Montreal, the use of dental compound. The cavity is filled with dental compound, the mould removed, the skin placed over it, then replaced in the cavity. It is left for five days, the compound taken out from behind, the wound sutured, and a very good skin graft is obtained.

If the dura is exposed at all, it is always important to make a big exposure. A small exposure opens up infection, but does not open up drainage. It has been my custom to expose a piece the size of a ten-cent piece whenever the sinuses or dura are exposed, and I have never seen any trouble. It has been argued that to expose the sinus widely helps to fill up the cavity and helps healing.

The after-care is very important: the care of the mastoid wound, keeping down granulations, and, more important, taking care of the nose and naso-pharynx to prevent reinfection, in case you have not closed off the tube.

Dr. J. F. Townsend, Charleston, S. C.—I would like to call attention to something I saw at the Surgical Congress in Boston the other day with regard to skin grafting in the radical mastoid operation. The physician of whose work I am speaking starts his operations by turning back the skin and soft tissue down to the periosteum, but does not elevate the periosteum. He then makes two incisions through the periosteum, forming a V with the apex at the external auditory canal and with a nasal elevator elevates the periosteum from the temporal bone to the edge of the external auditory canal, where he makes a pin-hole opening through the periosteum at the posterior edge of the external auditory canal. Through this opening he passes a sharp elevator, elevating the skin and the periosteum of external auditory canal to the membrana tympani and by two incisions cuts this tongue loose. That gives him a tongue of skin covering the periosteum of the external auditory canal, which he places at the bottom of the mastoid cavity, and this gives him a good start for the skin growth in the epidermitization of the mastoid cavity.

Dr. Hasty (closing).—The post-operative care of the patient is important and we can do many things to add to his comfort. I use large gauze dressings, and for three or four days the dressing is wet with some hot solution. Except in cases of labyrinthian disturbance I order a back rest the next day after the operation and let the patient out of bed after three or four days. Do not let him think he is bed-ridden. All of our cases have healed by first intention, and with one or two exceptions the scars can scarcely be detected.

I no longer attempt to do skin grafting, though the method suggested by Dr. Patton seems very good. I hope it will offer a solution of our difficulties.

Dr. Shea mentioned a very important point, and that is that all of the cells should be removed. The operation should be so complete as to leave no pathology.

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EDITORIAL DEPARTMENT

SOUTHERN MEDICAL ASSOCIATION
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THE PROPOSED NATIONAL DEPARTMENT OF EDUCATION AND WELFARE

A National Department of Health has been dreamed of for years by those who believe that one of the most important functions of a government is to protect the health of its citizens. At one time it seemed that our National Government would assume its responsibility in preventing disease, because it was known that if the United States had not entered the World War, President Wilson would have recommended to Congress the establishment of a Department of Health as provided for in the Owen Bill. This would have placed a physician in the President's Cabinet as Secretary of Health.

With the change of administrations and with the Republican party platform pledged to consolidate the governmental activities dealing with health and education into one department, it was hoped that the next best thing to a Department of Health would be the establishment of a Department of Health and Education. The proposed Department of Education and Welfare will carry out in a practical way the platform pledge of the Republican party; and if the new department is created the Harding administration should be credited with a great piece of constructive legislation for the benefit of the whole people. It is hoped that Democratic senators and congressmen will support the bill providing for the new department. The fact that we cannot secure a separate Department of Health should not deter those committed to that movement from aiding in securing legislation that will materially aid in the Government's doing its duty in advancing the cause of health and education.

There are many advantages in combining governmental activities dealing with health and education and it is hoped that under the proposed plan they will be more closely correlated. Indeed, much of the achievement in public health work has been due to the education of the public regarding the causes and the prevention of the communicable diseases.

Thomas Jefferson is credited with the saying that "the present generation is already lost; educate the youth of the nation". With this idea in view he founded the University of Virginia, which he regarded as one of the outstanding achievements of his life. Jefferson was right in his opinion that the education of the boys and girls will save the future men and women from the errors of their fathers and mothers, and it is also a fact that much may be done in educating the men and women in the things they should know about personal and public hygiene.

Perhaps the new Department of Education and Welfare will accomplish more at this time than could be done by separate departments of health and education. Ultimately these two of the most important functions of the Government will become separate departments of health and education; but in the evolution of things no

doubt it is best to establish the Department of Education and Welfare. Therefore, the medical profession should give its unqualified endorsement of the proposed legislation. With the coming meetings of the state medical associations the proposed department should be endorsed by all of them. Individual physicians can help in a cause for the betterment of mankind by writing their senators and congressmen expressing approval of the bill.

OPERATIVE INJURY TO THE URETER

Many of the world's best surgeons have done irreparable injury to the ureter during gynecologic operations; and there is every reason to believe that this accident has occurred hundreds or perhaps thousands of times in cases which have not been reported. Even when this tube lies in normal relation to adjacent structures the margin of safety, that is, the distance of the ureter from the cervix uteri, is not great; and when displacement of pelvic organs by tumors, inflammations, etc., occurs, knowledge of normal anatomy is of comparatively little avail.

If the ureter presented a rounded prominence anatomically and exhibited pulsations like an artery, it could be avoided more easily. And if when opened it gave striking and immediate warning as in the case of a blood vessel, the accident would be recognized at once. Several hours or days, however, may elapse before the injury is discovered; and treatment, if instituted then, has to be undertaken at serious disadvantage.

The more common and less serious operative ureteral injury is obstruction by ligation, clamping or kinking.[1] The less frequent and more serious accident is incision or division. Elsewhere in this issue[2] a contribution from animal experimentation is made to this subject by Dr. Walter C. Jones. Several striking results follow the free opening of the ureter intraperitoneally in animals. The immediate outcome is a walling-off process carried on by the intestines, omentum, etc., just as if infective material instead of mere urine were being poured out. This local reaction dams back the urine and leads ultimately but more slowly to the same results as primary ureteral obstruction, if the animal lives long enough. There is an almost complete absence of infection of appreciable severity. One might expect the mortality, great as it is, to be higher than that reported.

The operator to whom an accident of this kind happens may not report the case because he does not care to admit that he has allowed it to occur. Or he may not even know to what to attribute the stormy convalescence through which his patient passes. It is only by keeping constantly in mind the possibility of injury to the ureter that the surgeon can reduce to a minimum the percentage of accidents.

(1) Jones, W. C.: Experimental Ligation of One Ureter with Application of Results to Clinical Gynecology. American Jour. Obst., 1914, LXX, 324-410.

(2) Jones, W. C.: Experimental Intraperitoneal Division of One Ureter. So. Med. Jour., March, 1923, XVI, 188-198.

NATIONAL NEGRO HEALTH WEEK

The Chattanooga meeting of the Southern Medical Association was the occasion for the expression by several members of serious thinking on phases of the negro problem. In his presidential address Dr. Seale Harris[3] called attention to the fact that when first brought to the States the negro possessed mean proportions: that under slavery he was developed from a box-headed, pot-bellied, spindle legged

(3) Harris, Seale: Nutrition: The Most Important Public Health Problem of Today. So. Med. Jour., December, 1922, XV, 951-965.

dwarf into a splendid physical type. It is to be regretted that no wise and benign agency has since arisen to prevent him from reversion to type. That a tendency to this reversion exists was brought out by Dr. J. Ross Snyder[2] at the same meeting.

Dr. Snyder, dealing particularly with the children of the race, stated that the number of negro mothers not nursing their babies was steadily increasing, and that malnutrition was practically universal among artificially fed negro infants, general among negro children between the first and second years, and common among older children. This is due largely to economic causes: improper feeding, poor housing and sanitary conditions, and the fact that the negro not only earns small wages but is through his ignorance of values so cheated that he spends unwisely what he has.

Vital statistics show that disease is rampant in the negro race and its death rate in some localities now exceeds its birth rate. Due to public health efforts in very recent years, in some states there has been a decrease in the death rate. Further efforts are now to be made by the institution of a National Negro Health Week to begin on Sunday, April first of this year. This will be conducted by Dr. R. R. Moton[3], Principal of Tuskegee Institute, with the cooperation of various other organizations.

The diseased negro is as much a responsibility of the white medical profession as is the diseased white man, not only because of the profession's humanitarian interest in the prolongation of the life of the negro, but because every diseased negro is a menace to many white people. He has been, and, despite the rather steady exodus to the North, will probably continue to be, a peculiarly Southern problem. There is no doubt that the Southern physician of vision will aid any attempt to educate the negro along health lines not during one week only but throughout the years. A permanent organization of white physicians and laymen for the purpose of looking after the welfare of the negro race would be a valuable outcome of this educational week.

(2) Snyder, J. Ross: The Problem of the Negro Child. So. Med. Jour., January, 1923, XVI, 8-11.

(3) Health News, U.S.P.H.S. Bulletin, February, 1923.

Book Reviews

The Medical Interpreter, a Quarterly Digest of Medicine and Surgery, Domestic and Foreign, Illustrated, Selected Practical Foreign Medical and Surgical Literature. By Albert Allemann, A.B., M.D., Principal Assistant Librarian, Surgeon-General's Library, Army Medical Museum, Editor *Index Medicus*, Editor-in-Chief, Washington, D. C. Recent Practical Advances and Attitudes in Medicine and Surgery, by Capt. J. S. Taylor, Medical Corps, in charge U. S. Navy Division of Publications, Navy Department, Washington, D. C. The Bureau of Medicine and Surgery, by J. W. Schereschewsky, Assistant Surgeon-General in charge Division of Scientific Research, Washington, D. C.; J. W. Ellis, M.D., Medical Corps, U. S. Navy, Washington, D. C.; E. R. Whitmore, B.S., M.D., George Washington University Medical School, Naval Medical School, Washington, D. C.; C. F. Bolduan, in charge Section on Public Health Education, Washington, D. C.; Wm. A Brennan, Formerly Medical Department, the John Crerar Library, Chicago, Ill.; E. M. Salmonsen, Department of Medical Science, the John Crerar Library, Chicago, Ill.; and W. L. Barnes, Special Interpreter. 72 illustrations, 2 plates, and 252 pages. Volume No. V. Washington, D. C., Chicago, New Orleans, Atlanta. Southern Branch, Atlanta, Ga. The Interpreter Publishing Co., 1922.

In his foreword the Editor-in-Chief states that the reason for publication of the work was to bring to the physician doing general practice the more important articles in the form of a digest, as it is impossible for a busy practitioner to cover the extensive literature of the present day. He also states that because the American medical journals are more accessible, more stress will be placed upon foreign periodicals.

The articles appearing in the volume are carefully selected and edited and are in the main of practical significance.

Considering the large number of excellent medical journals published in America, the policy of limiting the domestic abstracts seems of a doubtful advantage.

The contents are arranged in alphabetical order for ready reference. It should serve a useful purpose and be of real advantage for those for whom it is written.

An Introduction to the Practice of Preventive Medicine. By J. G. Fitzgerald, M.D., F.R.S.C., Professor of Hygiene and Preventive Medicine and Director Connaut Antitoxin Laboratories, University of Toronto. Assisted by Peter Gillespie, M.Sc., C.E., M.E., I.C., Professor of Applied Mechanics, University of Toronto; and H. M. Lancaster, B.A., B.Sc., Director of Division of Laboratories, Provincial Board of Health, Ontario, and Demonstrator in Sanitary Chemistry, Department of Hygiene and Preventive Medicine, University of Toronto; and Chapters by Andrew Hunter, M.A., M.B., F.R.C.S.; J. G. Cunningham, B.A., M.B., D.P.H., and R. M. Hutton, with appendix articles by various contributors. With 128 text figures and 826 pages. St. Louis: C. V. Mosby Co., 1922. Cloth, $7.50.

The modern aspects of the subject are well presented and the book is so written as to be of practical use. The book is a credit to its author and publisher and a real addition to any medical library.

Physiology and Biochemistry in Modern Medicine. By J. J. R. Macleod, M.B., Professor of Physiology, University of Toronto, Toronto, Canada. Assisted by Roy G. Pearce, A. C. Redfield, N. B. Taylor and others. Fourth edition, with 243 illustrations, including 9 plates in colors, and 970 pages. St. Louis: C. V. Mosby Co., 1922.

The present edition of Professor Macleod's valuable book has been revised and largely rewritten in order to keep it abreast of the progress that is being made in biochemical research. In no other branch of medicine are discoveries and advances being made so rapidly. But this book thoroughly covers the field up to the time of publication and discusses many subjects now under investigation.

To those who know Dr. Macleod's work it suffices to state that a new edition is available. The physician who wishes to keep in step with advances in modern medicine, and who has not studied this work, can rest assured that the money and time spent on this book will prove the cheapest and most profitable post-graduate course that he can take.

The Pirquet System of Nutrition. By Dr. Clemens Pirquet, Professor of Pediatrics, University of Vienna, Austria. 96 pages. Philadelphia and London: W. B. Saunders Co., 1922. Cloth, $3.00.

This brief book contains the principal facts and the practical application of the well-known Pirquet theories. It also has a complete bibliography of the subject from the years 1917-1922, the values of the principal food stuffs, and a table of Pelidisi Indices. It will be very useful to the general practitioner and to all those who wish to fix in their minds the outlines of the system.

Manual of the Diseases of the Eye. For students and general practitioners. By Charles H. May, M.D., Director and Visiting Surgeon, Eye Service, Bellevue Hospital, New York; Attending Ophthalmic Surgeon to the Mt. Sinai Hospital, New York; Consulting Ophthalmologist to the French Hospital, New York, and to the Monmouth Memorial Hospital; Formerly Chief of Clinic and Instructor in Ophthalmology, College of Physicians and Surgeons, Medical Department, Columbia University, New York. Tenth Edition Revised. With 377 original illustrations, including 22 colored figures. New York: William Wood & Co., 1922. Cloth, $3.50.

The author has endeavored in this edition, as in the past, to give the fundamental facts of ophthalmology and to cover all that is essential in this branch of medicine, always keeping in mind that the book has been written for students and general practitioners. Space, therefore, has been allotted as the necessities of such readers require, estimated by an extended experience in teaching. Thus, rare conditions have merely been mentioned; uncommon affections, of interest chiefly to the specialist, have been dismissed with a few lines; and common diseases, which the general practitioner is most frequently called upon to treat, have been described with comparative fullness. The book is not recommended as a substitute for the larger works, but as a means of supplying a foundation to which further knowledge may be added by reference to more extensive and comprehensive textbooks.

An Index of Prognosis and End-Results of Treatment. By Various Writers. Edited by A. Rendle Short, M.D., B.S., B.SC., (Lond.), F.R.C.S. (Eng.); Member of Council British Association of Surgeons; Hon. Surgeon, British Royal Infirmary; Examiner for the First F.R.C.S.; Lecturer in Physiology, University of Bristol. Third edition, revised and enlarged. 594 pages. New York: William Wood & Co., 1922. Cloth, $12.00.

This volume is a companion to the "Index of Differential Diagnosis" by the same publishers.

The more important medical and surgical conditions are arranged in alphabetical order and these are ably discussed. The authors of the different sections are well chosen and their manner of presentation of the individual subjects adequate and in accordance with modern teachings.

The Practical Medicine Series. Chas. L. Mix, A.M., M.D., General Editor. Vol. I, Series of 1922. General Medicine. Edited by Geo. H. Weaver, M.D.; Lawrason Brown, M.D.; Robert B. Preble, A.M., M.D.; Bertram W. Sippy, M.D.; and Ralph C. Brown, B.S., M.D. 715 pages. Illustrated. Chicago: The Year Book Publishers, 1923.

A resume of medical literature during 1922. Of special value is the review of diseases of the chest by Lawrason Brown, and also the review of the literature of heart and blood vessels, by Preble.

Epidemiology and Public Health. A Text Book for Physicians, Medical Students and Health Workers. In three volumes, by Victor Vaughan, M. D., LL.D., Chairman Division on Medical Sciences, National Research Council; Emeritus Professor of Hygiene, University of Michigan, Assisted by Henry F. Vaughan, M. D., Dr. P. H., Commissioner of Health, City of Detroit; and George T. Palmer, M.S., Dr. P. H., Epidemiologist for Department of Health, City of Detroit. Vol. 1. Respiratory Infections. 668 pages, 83 text figures and 86 tables. St. Louis: C. V. Mosby Co., 1922. Cloth, $9.00.

The book is divided into twenty chapters on respiratory infections.

Certain sections stand out more prominently than others because of the recent experiences of the mobilization of the World War. Thus the accounts of the pneumonias, influenza, measles, and cerebro-spinal meningitis are given in greater detail than other subjects on which there has not been the recent intensive study. The section on poliomyelitis is also given in detail, as well as diphtheria, but in this later section it is to be regretted that the author did not give a brief discussion of the methods advised for sterilization of diphtheria carriers.

The book is pleasingly written, clearly expressed, and above all, the author always presents the data from which he draws his deductions.

The Principles of Electrotherapy and Their Practical Application. By W. J. Turrell, M.A., D.M., B.Ch. (Oxon), D.M.R.&E. (Constab.), Consulting Physician Oxford County and City Mental Hospital; Physician in Charge, Physiotherapy Department, Radcliffe Infirmary, Oxford, England, etc. Illustrated. 276 pages. New York: Oxford University Press, 1922. Cloth, $3.85.

The opening chapter on "The Therapeutic Action of the Constant Current" brings out the contrast between the old and the new ideas in this field of medicine.

The contrast with the average book of this type is quite refreshing, owing to its conservatism, as most electrotherapeutic works make exaggerated claims.

His discourse on the therapeutic action of the ultra violet and the x-rays, first by giving an accurate description of what each wave is, and then its function in health and disease, is well handled.

That section dealing with electro-diagnosis, while a recapitulation, is worthy of mention.

At this stage of medicine a book of this kind should be studied by every physician, for electricity is proving more and more an asset to the science.

Getting Ready to Be a Mother. A Little Book of Information and Advice for the Young Woman Who is Looking Forward to Motherhood. By Carolyn Conant van Blarcom, R.N., Author of "Obstetrical Nursing", "The Midwife in England". Formerly Assistant Superintendent and Instructor in Obstetrical Nursing and Care of Infants and Children, Johns Hopkins Hospital Training School for Nurses; Honorary Member Midwives' Institute, England. With an introduction by J. Clifton Edgar, M.D., Emeritus Professor of Obstetrics and Clinical Midwifery, Cornell University Medical College; Consulting Obstetrician, Bellevue Hospital; Surgeon, Manhattan Maternity and Dispensary; Consulting Obstetrician, New York Maternity, Jewish Maternity and Greenwich General Hospitals. And Frederick W. Rice, M.D., Associate Professor of Obstetrics N. Y. University and Bellevue Hospital Medical College; Consulting Obstetrician Bellevue Hospital; Assistant Surgeon, Manhattan Maternity and Dispensary; Assistant Surgeon St. Bartholomew's Clinic and Hospital. With 70 illustrations and 237 pages. New York: The Macmillan Co., 1922. Cloth, $1.50.

A splendid book upon a subject too often abused by sentimental or ignorant handling.

Arab Medicine and Surgery: A Study of the Healing Art in Algeria. By M. W. Hilton Simpson, B.Sc., Author of "Among the Hill Folk of Algeria," etc. New York: Oxford University Press, 1922. Cloth $3.50.

The author is a layman who was so fortunate as to have access to many of the secrets of the reticent physicians of Algeria. The fact that he is a physician is concealed jealously from most foreigners by the native Arab practitioner. Although superstitious and voodooistic customs prevail, these men have also a fund of antiquated information. The illustrations in the book are interesting. Many surgical, dental, and ophthalmic instruments are shown, and the materia medica is discussed. The book does not attempt to bring out anything to advance medicine, but to depict the crude state of Algerian medicine and surgery.

Generalized Pain. Part II of the Clinical Symptomatology of Internal Diseases. By Prof. Dr. Norbert Ortner, Vienna. Only Authorized Translation into the English Language of the Second German Edition, by Frances J. Rebman, with an Introduction by Thomas Webster Edgar, M.D., New York. 596 pages. New York: Medical Art Agency, 1922.

This book discusses the symptomatology of all pain except that in the abdominal region which has been fully dealt with in another book. The translation is accurate, though for clearness some of the involved German sentences have been shortened.

The subject of pain in every part is thoroughly covered, and practically every possibility suggested by headache, articular pain, pains in the chest, shoulder, heart region, neck, back, etc, is analyzed. Owing to the rapidity with which the entire subject is covered, the style of the book is not literary but rather a series of tabulatory paragraphs into which the author has crowded masses of facts from a wide clinical experience. It is a useful compilation and reference book.

The Practice of Surgery. By Russell Howard, C.B.E., M.S. (Lond.), F.R.C.S. (Eng.), Surgeon, London Hospital; Senior Surgeon, Poplar Hospital; Lecturer on Surgery and Teacher of Operative Surgery, London Hospital Medical College. Author of "Surgical Nursing," "The House Surgeon's Vade Mecum," etc., with 8 colored plates and 542 illustrations in the text of 1285 pages. Third edition. Philadelphia: J. B. Lippincott Co. London: Edward Arnold & Co., 1922.

This is a worth-while text book of surgery, though it is aimed to describe chiefly surgery as taught and practiced at the London Hospital. In this edition, the sections upon injury to the nerves, x-ray in the diagnosis of diseases of the stomach, duodenum and colon, upon fractures and injuries, upon syphilis and other parts have been greatly amplified.

Recipes for Institutions. Collected and edited by the Chicago Dietetic Association, Inc. For the Interest of Better Food for the Institutions. 163 pages. New York: The Macmillan Co., 1922.

As the title indicates, this is a book primarily for dieticians, which will prove practical, as it represents recipes from 70 dieticians of the leading hospitals in the United States. "The proof of the pudding is in the eating," so this is sufficient recommendation for those interested in this subject.

A Text Book of the Practice of Medicine, Oxford Medical Publication. By various authors. Edited by Frederick W. Price, M.D., F.R.S. (Edin.), Senior Physician, The Royal Northern Hospital; Physician, National Hospital for Diseases of the Heart, London; Formerly Physician and Honorary Pathologist, Mount Vernon Hospital for Consumption and Diseases of the Chest; and Examiner in Medicine, University of St. Andrew. 96 text figures and 1753 pages. New York: Oxford University Press, 1922.

The editor has assigned certain subjects to the different contributors, and at times it is apparent that they have been restricted as to space.

The sections on infectious diseases are not clearly written and give the impression that the authors were hurried.

Certain of the contributors stand out for the clearness of their presentation of their subjects. Tropical Medicine, by Geo. B. Low; Gastroenterology, by Arthur F. Hurst; and Trench Fever, by Lieut.-Col. Byam, being the ones worthy of mention.

The fact that the editor has included a section on skin diseases and psychological medicine departs from the purpose of the book.

Taking the work as a whole, although there are some good portions, it is difficult to see why it was published, as there are so many other text books on the same subject which cover the ground far more satisfactorily.

Vital Statistics. An introduction to the Science of Demography. By George Chandler Whipple, Professor of Sanitary Engineering, Harvard University; Member of Public Health Council, Massachusetts State Department of Public Health. Second Edition. 163 tables. 579 pages., New York: John Wiley & Sons, Inc., 1923. Cloth, $4.00.

This small volume, which was originally prepared for students of Harvard University and the Massachusetts Institute of Technology, is presented in text-book style by one who is the acknowledged authority on sanitary engineering.

The title sounds dull to one not directly engaged in work involving its use. However, Whipple has taken what is ordinarily regarded as a dry subject and has imparted to it a charm which is a revelation to the skeptical. It will open up a new field to any one willing to study it.

Other Books Received

The Causes of Heart Failure—(Harvard Health Talks).—By William Henry Robey, M.D., Assistant Professor of Medicine, Harvard University; Visiting Physician, Boston City Hospital. With 45 pages. Cambridge: Harvard University Press. London: Humphrey Milford, 1922. Cloth, $1.00.

Outlines of General Biology. An Introductory Laboratory Manual. By Charles W. Hargitt, Research Professor of Zoology in Syracuse University and George T. Hargitt, Professor of Zoology in Syracuse University. With 177 pages. Fourth Edition. Philadelphia and New York: Lea & Febiger, 1922. Cloth, $2.00.

Mental Deficiency (Amentia). By A. F. Tregold, M.D., M.R.C.P., F.R.S. (Ed.), Lecturer on Mental Deficiency, London University, Physician to Out-Patient Department and Lecturer at Bethelm Hospital; Physician and Neurologist, Royal Surry County Hospital, etc. Fourth edition, revised and enlarged. Frontispiece and 30 plates. 569 pages. New York: William Wood & Co., 1922. Cloth, $6.00.

A Clinical Treatise on Diabetes Mellitus. By Marcel Labbe, M.D., Professor of General Pathology, Faculty of Medicine, Paris; Physician the Charite Hospital, etc. Translated, Revised and Edited by Charles Green Cumston, M. D., Lecturer Faculty of Medicine of the University of Geneva; Fellow Royal Society of Medicine, London, etc. With four new chapters by the author and three by the editor not included in French edition. 382 pages. New York: William Wood & Co., 1922. Cloth, $5.00.

Principles and Practice of X-Ray Technic for Diagnosis. By John A. Metzger, M.D., Roentgenologist, School for Graduates of Medicine, Medical Department, University of California, Southern Division, Los Angeles, Calif. 161 illustrations. 144 pages. St. Louis: C. V. Mosby Co., 1922. Cloth, $2.35.

Southern Medical News

HOME-COMING MEETING OF THE SOUTH CAROLINA STATE MEDICAL ASSOCIATION

The South Carolina State Medical Association will celebrate the seventy-fifth anniversary of the founding of the Association with a "home-coming" meeting to be held in Charleston, April 17-18-19, 1923. Among the distinguished guests who will address this meeting are: Dr. W. S. Leathers, Jackson, Miss., President of the Southern Medical Association, and Dr. C. C. Bass, New Orleans, La., Dean of the Medical Department of Tulane University. The Association hopes to have at this "home-coming" meeting every doctor who has ever lived in South Carolina. Dr. E. A. Hines, Secretary, Seneca, S. C., wants your name if you are a former South Carolinian.

ALABAMA

Jefferson County Medical Society has elected Dr. R. H. Hamrick, President; Dr. E. L. Scott, Vice-President; Dr. W. B. Hardy, Secretary-Treasurer.

Plans are being made to erect a maternity wing to the Albany Hospital as a memorial to the late Dr. M. W. Murray, Albany. The estimated cost of the annex will be $50,000.

The personnel of the Tennessee Valley Laboratory, which recently opened in Decatur, is as follows: Dr. H. C. McRae, County Health Officer; Col. W. D. Wrightson, Federal Sanitary Engineer; Miss Nina Elderidge, Technician; Mrs. Vera Austell, Accountant; Miss Ella Dale, County Health Nurse; Miss Brockway, Assistant to Miss Elderidge; J. M. Holly, Sanitary Inspector.

At a recent meeting of the State Board of Health in Montgomery, resolutions were passed paying tribute to Dr. S. W. Welch, State Health Officer, for educating the people to the extent that the death rate in Alabama from infectious diseases had been materially lowered.

Dr. John Long, formerly with the U. S. Army, stationed at Fort Sill, Okla., has taken up his duties as head of the x-ray department of the Colbert County Hospital, Sheffield.

Lauderdale County Medical Society has elected Dr. A. A. Jackson, President; Dr. Harry Simpson, Vice-President; Dr. W. D. Hubbard, Secretary; Dr. P. I. Price, member Board of Censors.

Dr. J. D. Dowling, Health Officer of Birmingham, and Dr. George A. Cryer, Health Officer of Calhoun County, have been appointed members of the Royal Institute of Public Health of Great Britain.

Deaths

Dr. Martin Luther Malloy, Eutaw, aged 47, died December 27 in a Tuscaloosa hospital as a result of stab wounds.

Dr. William Walne Wallace, Birmingham, aged 25, died December 27 from influenzal pneumonia.

Dr. James Spencer Mackey, Rogersville, aged 46, died December 18 from pneumonia.

ARKANSAS

Benton County Medical Society has elected Dr. T. E. Hodges, Rogers, President; Dr. C. S. Wilson, Gentry, Vice-President; Dr. C. A. Rice, Rogers, Secretary-Treasurer.

Craighead County Medical Society has elected Dr. O. V. Smith, President; Dr. R. W. Ratcliff, Vice-President; Dr. Thad Cothern, Secretary; Dr. J. T. Altman, Treasurer.

Drew County Medical Society has elected Dr. E. R. Cotham, President; Dr. M. Y. Pope, Vice-President; Dr. F. L. Duckworth, Secretary.

Faulkner County Medical Society has elected Dr. N. E. Fraser, President; Dr. J. E. McMahan, Vice-President; Dr. J. S. Westerfield, Secretary-Treasurer.

Hempstead County Medical Society has elected the following officers: Dr. J. H. Weaver, President; Dr. G. E. Cannon, Vice-President; Dr. M. V. Russell, Secretary.

Independence County Medical Society has elected Dr. T. N. Rodman, President; Dr. I. M. Huskey, Vice-President; Dr. M. S. Craig, Secretary-Treasurer.

Miller County Medical Society has elected Dr. R. H. T. Mann, President; Dr. F. M. Lennard, Vice-President; Dr. H. E. Murry, Secretary.

Mississippi County Medical Society has elected Dr. J. A. Saliba, Blytheville, President; Dr. O. Barksdale, Wilson, Vice-President; Dr. F. D. Smith, Blytheville, re-elected Secretary.

Saline County Medical Society has elected Dr. Dewell Gann, President; Dr. J. M. Phillips, Secretary.

Plans have been announced for the erection of an annex to the Warner-Brown Hospital, El Dorado, at a cost of $160,000. Paul Brown donated the present building and will erect the addition.

Officers elected for the State School Directors' Association are Dr. Chas. S. Holt, Fort Smith, President; Dr. B. D. Luck, Pine Bluff, Vice-President.

Dr. C. A. Williams, El Dorado, has been appointed full-time health officer, succeeding Dr. S. J. McGraw, who resigned as head of the health board.

Deaths

Dr. Zaphney Orto, Pine Bluff, aged 80, died January 22.

Dr. Charles McRae Morgan, Tucker, aged 50, died January 14.

Dr. Vardiman M. O. McDowell, North Little Rock, aged 65, died December 18.

Dr. C. A. Mitchell, Sheridan, aged 66, died January 1, after a long illness.

DISTRICT OF COLUMBIA

A bill introduced by Representative Fess, by which an appropriation of $150,000 is made as part contribution toward a memorial building in the District of Columbia to commemorate the services and sacrifices of the patriotic women of the United States during the World War, stipulates that the memorial shall cost $300,000 and that it shall be used as a permanent model chapter house of the American Red Cross under charge of the District of Columbia chapter.

The Women's Welfare Association, Washington, recently opened a special clinic for the treatment of asthma and hay fever in young people, as the first step in the anti-asthma campaign for the benefit of young girls. The clinic will be held every Friday.

Deaths

Dr. Horace Benjamin Coblentz, Washington, aged 51, died January 24 from heart disease.

Dr. John H. Metzerott, Washington, aged 57, died January 3 at the Sibley Memorial Hospital following an operation.

Dr. Francis B. Loring, Washington, aged 72, died January 14.

FLORIDA

Duval County Medical Society has elected Dr. John E. Boyd, President; Dr. Elmo D. French, Vice-President; Dr. Francis A. Copp, Secretary; Dr. John K. Norwood, re-elected Treasurer.

GEORGIA

The 240 members of the Atlanta Dental Society are cooperating in a drive for better teeth among school children, each dentist treating, free of charge, at least one child. The portable dental clinic of the Atlanta public schools reported 11,669 children with defective teeth among pupils of nine public schools examined recently.

Dr. Roger C. Swint has been appointed Superintendent of the Georgia State Sanatorium, Milledgeville, succeeding the late Dr. L. M. Jones.

Dr. Thomas W. Reid, Jr., Thomasville, has been appointed Physician to Thomas County.

Dr. W. W. Crook, Cuthbert, is taking a six weeks' post-graduate course in New Orleans.

Dr. G. Y. Moore, Cuthbert, was recently elected Health Physician, succeeding Dr. F. D. Patterson.

Dr. F. M. Martin, Shellman, and Dr. J. C. Patterson, Cuthbert, are taking a post-graduate course in New Orleans.

Dr. Alice Moses, Atlanta, has been appointed Director of Child Hygiene of Georgia under the State Department of Health, succeeding Dr. Dorothy Bocker, who has returned to her home in New York.

Bartow County Medical Society has elected Dr. R. P. Adams, Bethelehem, President; Dr. S. T. Ross, Winder, Vice-President; Dr. W. T. Randolph, Winder, Secretary-Treasurer.

Clarke County Medical Society has elected Dr. A. A. Rayle, President; Dr. H. I. Reynolds, Vice-President; Dr. Joseph S. Stewart, Jr., Secretary-Treasurer.

Dr. Conrad E. Keorper has resigned as Acting Health Officer of Savannah.

Dr. Lehman William Williams and Miss Metta Martha Harr, both of Savannah, were married November 22.

Dr. Julian Holt Ruff and Miss Joyce Louise White, both of Atlanta, were married January 4.

(Continued on page 38)

Dr. Walter A. Weed

Wishes to announce the installation of a 280,000 Volt Deep Treatment X-ray Transformer with modern accessory equipment as a further acquisition to his treatment facilities.

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(Continued from page 236)

Dr. Edwin Nash Broyles, Atlanta, and Miss Eleanor Curtis Whiteley, Baltimore, Md., were married January 6.

Deaths

Dr. Robert Berrien Ridley, Sr., Atlanta, aged 80, died January 22 from pneumonia.

Dr. Andrew Jackson Deas, Augusta, aged 59, died October 30 following an operation.

Dr. Andrew J. Cavender, Murrayville, aged 63, died December 27 at the home of his daughter in Gainesville from cerebral hemorrhage.

Dr. John Andrew Brown, Sparta, aged 36, died January 6 from pneumonia, following influenza.

Dr. Arthur Bernheim Prince, Kingsland, aged 34, died December 25.

KENTUCKY

Meade County Board of Health was recently organized. The following officers were elected: Dr. A. A. Baxter, Secretary and County Health Officer; Judge Baskett, Chairman. Other members are Dr. J. L. Allen, Concordia, Dr. B. R. Walker, Ekron, and S. L. Morgan, Brandenburg.

Scott County Board of Health was recently reorganized. The following officers were appointed: Dr. W. H. Coffman, Dr. H. V. Johnson, Dr. William Mason, Mrs. H. C. Blackburn and Judge J. B. Ward.

Fayette County Medical Society has elected Dr. S. B. Marks, President; Dr. Scott Breckinridge, Vice-President; Dr. W. H. McLean, Secretary.

Fulton County Medical Society has elected Dr. H. C. Marshall, Hickman, President; Dr. D. L. Jones, Fulton, Vice-President.

Kentucky Midland Medical Society has elected Dr. J. W. Gilbert, Lawrenceburg, President; Dr. H. V. Johnson, Georgetown, Vice-President; Dr. W. H. McLean, Lexington, Secretary-Treasurer.

Mason County Medical Society has elected Dr. W. H. Taulbee, President; Dr. W. E. Hord, Vice-President; Dr. Lovel Samuels, Secretary.

Washington County Medical Society has elected Dr. J. B. Overall, President; Dr. Frank Hamilton, Vice-President; Dr. J. H. Hopper, Secretary.

The Advisory Committee of the State Board of Charities and Corrections has appointed fifteen Lexington physicians as a local consulting staff of the State Board to work with the resident staff of the Eastern Kentucky State Hospital and State School of Reform at Greendale in providing proper medical care to the inmates of the two institutions.

Dr. W. K. Price, Richmond, has been elected City Health Officer.

The Children's Bureau of the United States Department of Labor, in a survey of the diet and care of Southern mountain children, reported that only 16 per cent of the children studied belonged to families which were able to provide the modest requirements of adequate living. The survey was made at the request of the State Board of Health to discover why a state famous for its prosperity should turn out so large a percentage of physically defective men as the draft record showed.

Dr. Urey G. Davis, Hopkinsville, has resigned his position as Assistant Superintendent of the Western State Hospital and has accepted the position of Neuropsychiatrist for the Veterans' Bureau, and will be located at Lexington.

Warren County Board of Health has elected the following officers: Dr. E. N. Hall, President; Dr. C. E. Francis, Secretary-Treasurer. Other members are Dr. W. C. Simmons, Dr. S. J. Martin and Judge Charles Drake.

Franklin County Board of Health has re-elected Dr. E. C. Romele as County Health Officer.

Dr. Charles B. Kobert, Director of the Bureau of Trachoma of the State Board of Health, recently held a traveling trachoma clinic in Mt. Sterling.

Mrs. Ethel Osborne, Berry, has been elected City Health Officer.

Dr. Frederick G. Speidel has been assigned permanently as the City Health Department's Physician in the Portland District, succeeding Dr. Louis W. Eckels, Jr.

Dr. E. A. Morgan, formerly with the State Insane Hospital, Pineville, La., has joined the staff of the Western State Hospital, Hopkinsville, succeeding Dr. W. O. Davis.

Deaths

Dr. Oldron Aloysius Mitchell, St. Mary, aged 39, was instantly killed January 12 when his automobile plunged over a 50-foot embankment near Raywick.

Dr. James W. Hill, Hopkinsville, aged 53, died January 19 from chronic nephritis.

(Continued on page 40)

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(Continued from page 38)

Dr. Ferdinand Edward Peck, Stearns, aged 46, died December 21 from pneumonia.

Dr. Eugene T. Ellison, Glasgow, aged 68, died January 27 from pneumonia.

Dr. Walter F. Lyons, Winchester, aged 41, died January 25 from pneumonia.

Dr. William Henry Martin, Poindexter, aged 90, died January 23 from bronchitis.

Dr. Clinton Wayne Kelly, Louisville, aged 78, died January 26 from pneumonia.

Dr. James S. Brown, Warsaw, aged 80, died January 23.

Dr. W. W. Ray, Bloomfield, aged 71, died January 25 from heart trouble.

Dr. W. N. Day, Lone Mountain, died January 25.

LOUISIANA

St. Landry Parish Medical Society has elected Dr. Paul Foster, President; Dr. S. B. Wolff, Vice-President; Dr. A. B. Pavy, Secretary-Treasurer.

St. Martin Parish Medical Society has elected Dr. S. D. Yongue, President; Dr. J. L. Beyt, Vice-President; Dr. P. H. Flemming, Secretary-Treasurer.

The heirs of the late Samuel Schwartz have increased the building fund of the annex to the Touro Infirmary, New Orleans, by $15,000. A ward in the new annex will be named in memory of Samuel Schwartz. Mr. Bonart has provided two baby incubators for the Infirmary; Dr. J. W. Newman, New Orleans, has donated $5,000 for maternity work.

The National Association of Public Health Nursing has chosen New Orleans as one of the thirteen American cities in which a survey will be made relative to certain phases of public health nursing.

The Central Council of Social Agencies has elected Professor G. P. Wyckoff, President; Mrs. F. C. Coleman, Vice-President; Galen F. Achauer, Secretary; William Pfaff, Treasurer.

The Louisiana Radiological Society has elected Dr. L. A. Fortier, New Orleans, President; Dr. C. P. Rutledge, Shreveport, Vice-President; Dr. Edwards, Lafayette, Secretary-Treasurer.

Dr. Joseph A. Danna, New Orleans,, has been elected to the Board of Governors of the American College of Surgeons.

The Greenwell Springs Tuberculosis Sanatorium, near Baton Rouge, was recently totally destroyed by fire with a loss estimated at $50,000.

Dr. J. M. Batchelor, New Orleans, has been appointed Chief Surgeon of the Presbyterian Hospital, New Orleans.

Dr. Homer Raymond Blincoe, New Orleans, and Miss Elizabeth Hahn, Mobile, Ala., were married December 30.

Dr. Francis Ernest LeJeune, New Orleans, and Miss Anna Lynn Dodds, Clarksdale, Miss., were married recently.

Deaths

Dr. Thomas A. Roy, Mansura, aged 56, died January 24 from cerebral hemorrhage.

Dr. Hugo A. Gabert, Mandeville, aged 70, died suddenly January 10 from heart disease.

Dr. John Williamson Caldwell, New Orleans, aged 80, died January 2 from sanility.

Dr. George Humphrey Tichenor, Sr., New Orleans, aged 85, died January 14 from heart disease.

Dr. G. C. Chandler, Shreveport, aged 57, died January 25.

MARYLAND

The Board of Mental Hygiene has announced the following appointments: Drs. Hugh H. Young, George H. Hocking, Henry J. Berkley and J. Albert Chatard, all of whom were members of the old Lunacy Commission. Other members are H. Findlay Finch and Mrs. Athey. Later a Commissioner of Mental Hygiene will be appointed.

The Allegany County Public Health Association was recently organized for the purpose of assisting in all public health activities in the county and financing a public health nurse for the county outside of Cumberland.

The chemical laboratory of the Johns Hopkins University now under construction will cost $600,000.

Dr. William T. Pratt has been appointed full-time County Health Officer for Montgomery County.

Dr. Karl M. Wilson, Associate in Clinical Obstetrics at Johns Hopkins University, has been appointed Professor of Obstetrics at the University of Rochester Medical School.

Dr. Benjamin C. Perry, Baltimore, has been appointed a member of the State Board of Health.

(Continued on page 42)

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(Continued from page 40)

Dr. William H. Welch, Baltimore, has been elected an honorary member of the Societe Royale des Sciences Medicales et Naturelles of Brussels, Belgium.

Dr. William S. McCann, Associate Professor of Medicine at Johns Hopkins University, Baltimore, has been appointed Professor of Medicine at the University of Rochester Medical School, New York.

Bids for contracts will soon be asked for the new $1,000,000 home of the Johns Hopkins School of Hygiene and Public Health. The structure will be of Italian architecture of brick and stone, provided through a donation to the school by the Rockefeller Foundation.

William Walter Cort, Ph.D., Associate Professor of Helminthology, Johns Hopkins School of Hygiene and Public Health, has been appointed Exchange Professor in Parasitology in the Peking Union Medical College, China. He will also carry on an extensive study of hookworm disease in South China. He will head a party of four scientists to carry on research work under the auspices of the Peking Union Medical College, which expedition will be financed by the International Health Board of the Rockefeller Foundation.

Drs. George Walker and Herbert C. Blake, Baltimore, have been appointed members of the Board of Supervisors of City Charities.

Dr. Arthur P. Herring, Baltimore, has been appointed Commissioner of Mental Hygiene.

Dr. Glenn R. Gross, Baltimore, and Miss Janet Langford, Frostburg, were married at Washington, D. C., November 25.

Dr. Charles Sumner Levy, Baltimore, and Miss Ruth Bear, Lonaconing, were married at Cumberland December 27.

Deaths

Dr. Edward F. Milholland, Baltimore, aged 85, died December 23 from pneumonia.

Dr. Wilbur Phelps Morgan, Baltimore, aged 81, died December 20 from senility.

Dr. Henry H. Flood, Catonsville, aged 50, died suddenly December 14 at the St. Agnes Hospital, Baltimore.

Dr. Frank H. Ruhl, Lansdowner, aged 60, died January 6.

Dr. Thomas J. Talbott, Jr., Baltimore, aged 50, died January 1 from cerebral hemorrhage.

Dr. Isham Randolph Page, Baltimore, aged 89, died January 1 from senility.

MISSISSIPPI

The annual meeting of the Mississippi State Medical Association will be held at Vicksburg May 8-9 instead of at Jackson, as previously announced. Lack of hotel accommodation due to remodeling hotel headquarters in Jackson is the reason for the change.

Central Medical Society has elected Dr. John H. McLain, President; Dr. Roland W. Hall, Secretary-Treasurer. A Vice-President was elected from each of the counties of Yazoo, Smith, Madison, Rankin, Hinds and Simpson, which compose the Society.

North Mississippi Six Counties Medical Association has elected Dr. S. E. Eason, New Albany, President; Dr. C. M. Murry, Ripley, Vice-President; Dr. George A. Brown, Water Valley, Secretary-Treasurer. Drs. C. M. Speck, F. Ferrel, I. B. Seale, R. M. Adams, B. S. Guyton and S. E. Cooper were elected as Assistant Secretaries.

South Mississippi Medical Association has elected Dr. John R. DeVelling, Laurel, President; Dr. Joseph S. Gatlin, Laurel, Secretary-Treasurer.

Deaths

Dr. Clyde C. Wallace, Cruger, aged 35, died January 15 at Greenwood from injuries sustained when the automobile in which he was driving overturned.

Dr. Embry Pryor Wilson, Houston, aged 46, died January 12 from influenza.

MISSOURI

Montgomery County Medical Society has re-elected the following officers: Dr. David Nowlin, President; Dr. G. E. Muns, Vice-President; Dr. Buell Menefee, Secretary.

St. Louis Medical Society has elected Dr. William H. Vogt, President; Drs. Horace W. Soper and Robert F. Hyland, Vice-Presidents; Dr. Thomas N. Toomey, Secretary.

The State Board of Health has elected Dr. Emmett P. North, St. Louis, President; Dr. Rudolph S. Vitt, St. Louis, Vice-President; Dr. Cortez F. Enloe, Jefferson City, Secretary and Health Commissioner.

The Health Board of St. Joseph has elected Dr. Horace W. Carle, President; Dr. Baxter W. Tadlock, Vice-President.

The National Tuberculosis Association, after a careful study of all research work being carried on in that field of

(Continued on page 44)

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(Bailey-Terrell Laboratories).

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TOPEKA, KANSAS
(Lattimore Laboratory).

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work, has assigned first rank to the investigations of Dr. Eugene L. Opie, Professor of Pathology in the School of Medicine of Washington University, St. Louis. In recognition of his work he has been awarded a grant of $3,000 for the twelve months beginning November 1, 1922, for the further prosecution of his researches.

Dr. Duncan D. Campbell, Chicago, has been appointed Superintendent of State Hospital No. 2, St. Joseph.

Dr. F. W. Mann, Wellington, has been appointed County Physician for one year.

Dr. R. T. Terry, Professor of Anatomy, Washington University School of Medicine, St. Louis, has been elected Secretary for the Anthropologic Section of the American Association for the Advancement of Science.

Dr. W. J. Hunt, St. Joseph, has been appointed Pathologist in charge of the laboratories for all of the State eleemosynary institutions and will move to Fulton, where the laboratories are located.

The following physicians have been elected to the General Assembly: representatives, Dr. Frederick L. Ogilvie, Scott County; Dr. Robert F. McReynolds, Knox County; Dr. Heine Marks, City of St. Louis, Fifth District; Dr. Williams A. Porter, Lafayette County, and Dr. L. V. Cockrum, Lewis County. Dr. Benjamin B. Tout, Cass County, was re-elected to the Senate.

Dr. C. D. Miller, Springfield, has been named President of the State Board of Charities and Corrections.

Dr. Jacob J. Singer, St. Louis, has been appointed Consultant in Diseases of the Chest at the State Sanatorium, Mt. Vernon.

Dr. George M. Boteler, City Health Officer of St. Joseph, has resigned to accept the position of Assistant Health Officer of the District of Columbia, and will reside in Washington.

Deaths

Dr. John Howard Nixon, Springfield, aged 60, died January 9.

Dr. Ayman E. Kean, St. Louis, aged 48, died January 7 from injuries sustained in an automobile accident.

Dr. Anna E. Rhoads, St. Louis, aged 80, died December 20 at the Christian Church Home from senility.

Prof. George Lefevre, Ph.D., Professor of Biology at the University of Missouri School of Medicine, Columbia, died January 24 from pneumonia.

Dr. Omar E. Amos, Jefferson City, was shot and killed January 9.

Dr. Alpheus B. Allstun, Deering, aged 44, died January 19.

Dr. William H. Pye, Sr., Braymer, aged 84, died January 16 from euremic poisoning.

NORTH CAROLINA

The Seaboard Medical Association of Virginia and North Carolina met in New Bern in December. The following officers were elected: Dr. Joseph T. Buxton, Newport News, Va., President; Drs. William E. Warren, Williamston, Cora Z. Corpening, Suffolk, Va., George A. Caton, New Bern, and Russell M. Cox, Portsmouth, Va., Vice-Presidents; Dr. Clarence Porter Jones, Newport News, Va., Secretary-Treasurer.

The Association of the Seaboard Air Line Railway Surgeons, at the annual meeting in Pine Hurst, elected the following officers: Dr. R. B. Epting, Greenwood, S. C., President; Drs. J. E. Johnson, Elberton, Ga., H. H. Bass, Henderson, N. C., and T. M. McDuffee, Manatee, Fla., Vice-Presidents; Dr. J. W. Palmer, Ailey, Ga., re-elected Secretary-Treasurer.

Dr. George B. Nance, Monroe, has been re-elected County Physician and Quarantine Officer of Union County.

Dr. G. M. Cooper, Director of the Division of Medical Inspection of Schools, states that dental clinics were held in thirty-nine counties during the year 1922 and 32,382 children received free dental treatment. More than 40,000 teeth were permanently filled. The work has the support of the North Carolina Dental Society. Tonsil clinics were held in twenty-eight counties, in which 2,488 children were successfully operated upon by leading specialists in the State.

Drs. Robert L. Gibbon, Charlotte, and Edgar H. Hand, Pineville, have been appointed members of the Board of Health of Mecklenburg County.

Dr. Morrill Illsley, New Bern, has been appointed Health Officer for Craven County.

Dr. Sidney E. Buchanan, Concord, has been reappointed County Physician.

The new addition to St. Peter's Hospital, Charlotte, will be constructed at a cost of approximately $65,000.

Dr. Robert G. Wilson, Biltmore, has been re-elected Health Officer of Buncombe County.

(Continued on page 46)

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(Continued from page 44)

Iredell-Alexander County Medical Society has elected the following officers: Dr. C. L. Sherrell, President; Dr. J. W. Davis, Vice-President; Dr. J. E. McLaughlin, re-elected Secretary-Treasurer for the twentieth year in succession.

Dr. John Samuel Talley, Troutmans, and Miss Edith Murdock McLaughlin, Statesville, were married October 12.

Deaths

Dr. William Grimsley Taylor, Greensboro, aged 27, died December 28 from pneumonia and pleurisy.

Dr. Danile Eugene Eagle, Statesville, aged 26, died January 22 at the Johns Hopkins Hospital, Baltimore, from abscess of the liver.

Dr. James R. Williams, High Point, aged 88, died January 2 from senility.

Dr. John R. Wheless, Spring Hope, aged 54, died December 4 from cerebral hemorrhage.

Dr. Frank Jesse Thorp, Rocky Mount, aged 70, died January 13.

Dr. Newton Robinson, Elizabethtown, died December 19.

Dr. John Henry McMullan, Edenton, aged 73, died recently in a hospital in Norfolk following an abdominal operation.

OKLAHOMA

Grady County Medical Society has re-elected Dr. Martha L. Bledsoe, Chickasha, President.

Logan County Medical Society has elected Dr. Charles B. Barker, President; Dr. Henry W. Larkin, Vice-President; Dr. John L. Houseworth, Secretary-Treasurer.

Dr. Harvey E. Rappolee, Madill, has been appointed Health Officer for Marshall County, succeeding Dr. Thomas A. Blaylock.

Dr. John T. Wharton, Miami, has resigned as County Health Officer of Ottawa County and accepted the appointment of Superintendent of the Soldiers' Tuberculosis Sanatorium, Sulphur.

Dr. Isaac N. Cottle, Oklahoma City, has been elected Health Officer of Oklahoma County.

Lieut.-Col. Arthur M. Whaley, M.C., U. S. Army, Fort Sill, has been awarded the distinguished service medal in recognition of his work in the care and evacuation of the wounded in France.

Dr. L. A. Mitchell, Frederick, has been elected Commander of his American Legion post.

Dr. A. E. Davenport, Oklahoma City, has been appointed State Health Commissioner of Oklahoma, succeeding Dr. Arthur R. Lewis.

Dr. Fred Y. Cronk, Tulsa, has been appointed General Chairman of Committees for the annual meeting of the State Association to be held in that city May 15-17.

Drs. Charles L. Reeder, Robert S. Wagner and Francis C. Myers have been elected members of the Board of Health of Tulsa.

Dr. George E. Hartshorne, Tulsa, has been appointed County Health Officer to succeed Dr. C. L. Reeder.

The contract has been let for the new $125,000 maternity hospital to be erected in Tulsa. The Woman's Hospital Association is the donor.

Dr. Albert C. Lucas, Castle, and Miss Grace Philpots, Okemah, were married November 20.

Deaths

Dr. James Edgar Yarbrough, Erick, aged 46, died in December from heart disease.

Dr. Henry Shepard, Tahona, aged 75, died December 10.

Dr. William F. Hazelton, Enid, aged 79, was found dead December 31 from cerebral hemorrhage.

Dr. Tilmon Leroy Noblitt, Erick, aged 49, died December 22.

Dr. Peter C. Bradley, Shawnee, aged 69, died January 9.

Dr. Waverly McGee Hume, Coalgate, aged 59, died January 20 at Sherman, Tex.

Dr. George Clinton Evans, Tulsa, died December 13 at the Oklahoma Hospital from senility.

Dr. Elves T. Tribble, Yeager, aged 63, died December 31 at the home of his brother in Bloomfield, Mo.

SOUTH CAROLINA

Charleston County Medical Society has elected Dr. A. J. Buist, President; Dr. J. B. Johnson, Vice-President; Dr. J. C. Sosnowski, Secretary; Dr. J. H. Cannon, Treasurer.

Dr. Bayliss H. Earle, Greenville, has been appointed County Health Officer to succeed Dr. Eugene O. Chimene, resigned.

Dr. E. V. Valz, Medical Commander at the Navy Yard in Charleston, has begun a tour of duty on board the battleship Arkansas.

(Continued on page 48)

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(Continued from page 46)

Deaths

Dr. L. Theophilus Hill, Abbeville, aged 70, died December 26 from cerebral hemorrhage.

Dr. William J. Holloway, Chappells, aged 77, died December 28.

Dr. Enos Walter Dickson Wright, Langley, aged 50, died December 4 at the Margaret Wright Hospital, Augusta, Ga., from a fractured skull received when the automobile in which he was driving was struck by a train.

Dr. Benjamin F. Few, Greer, aged 93, died January 21 from senility.

Dr. Butler W. Cobb, Greenwood, aged 70, died January 2.

Dr. Absolom Jerome Christopher, Laurens, died January 10 at the Mayo Brothers Hospital, Rochester, Minn.

TENNESSEE

Haywood County Medical Society has elected Dr. John Chambers, President; Dr. W. R. Miller, Vice-President; Dr. J. L. Edwards, Secretary-Treasurer.

Knox County Medical Society has elected Dr. R. E. Lee Smith, President; Dr. M. H. Lee, Vice-President; Dr. Jesse C. Hill, Secretary-Treasurer.

Marion County Medical Society has elected Dr. W. L. Nichols, President; Dr. J. W. Kirkpatrick, Vice-President; Dr. W. R. Irish, Secretary-Treasurer.

Polk County Medical Society has elected Dr. A. J. Guinn, President; Dr. H. P. Hyde, Vice-President; Dr. F. O. Geisler, Secretary-Treasurer.

Roane County Medical Society has elected Dr. G. E. Wilson, President; Dr. J. A. Sewell, Vice-President; Dr. W. W. Hill, Secretary-Treasurer.

Smith County Medical Society has elected Dr. J. H. Chism, President; Dr. W. B. Dalton, Vice-President; Dr. B. J. High, re-elected Secretary-Treasurer.

Wilson County Medical Society has elected Dr. J. H. Puryear, President; Dr. Dallis L. Cornwell, Vice-President; Dr. Walter S. Dotson, Secretary-Treasurer.

It has been announced that the venereal disease and oral hygiene departments will be discontinued by the State Board of Health.

Dr. William E. McGaha, who, with Dr. Harry J. Lemmon, has been operating the Church Street, Hospital, Newport, has resigned and Dr. Lemmon is now the sole owner.

Dr. Duncan Eve, Sr., head of the Department of Surgery of the Vanderbilt University Medical School, has been honored by the senior medical class by being elected as an honorary member. Dr. Eve's portrait will be presented by the seniors to the Medical School memorial hall.

Dr. Edmund B. Allen has been elected City Health Officer of Murfreesboro, succeeding Dr. J. S. Allen.

Dr. L. S. Nease, Newport, has been appointed Surgeon for the Southern Railroad, succeeding the late Dr. John F. Stanbery.

Dr. M. B. Davis has resigned as Superintendent and Resident Surgeon at the City Hospital, Nashville. He is succeeded by Dr. E. H. McGee, his Assistant.

Dr. William Dulaney Anderson, Chattanooga, and Miss Rosalie Slaughter, Lynchburg, Va., were married December 16.

Deaths

Dr. William Pinkney Atchley, Knoxville, aged 53, died January 12.

Dr. Robert A. Tate, Bolivar, aged 78, died January 12 from senility.

Dr. Sidney Thompson, Humboldt, aged 62, died January 28 from heart disease.

Dr. I. L. Davis, Shady Grove, aged 75, died in January.

Dr. G. W. Boyte, Ashland City, aged 72, died January 19 at the home of his daughter in Nashville.

Dr. William Newton Day, Lone Mountain, aged 54, died January 19.

TEXAS

Bee County Medical Society has elected Dr. L. L. Griffin, President; Dr. A. J. Turner, Vice-President; Dr. Houston Neeley, Secretary-Treasurer. All were re-elected.

Bell County Medical Society has elected Dr. L. W. Pollok, Temple, President; Dr. J. W. Pittman, Belton, Vice-President; Dr. J. B. Johnson, Temple, Secretary-Treasurer.

El Paso County Medical Society has elected Dr. C. M. Hendricks, President; Dr. E. B. Rogers, Vice-President; Dr. F. O. Barrett, Secretary-Treasurer.

Erath County Medical Society has elected Dr. J. B. Gordan, Stephenville, President; Dr. A. O. Cragwell, Stephen-

(Continued on page 50)

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A sphygmo-manometer of precise accuracy, whose utter simplicity and proven reliability has merited the high esteem in which it is held by thousands.

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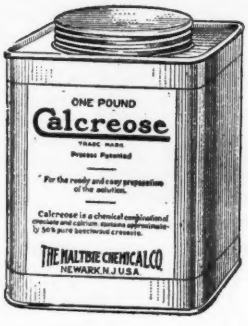

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"* * * one remedy which brings some comfort and encouragement in the struggle against the condition of mixed infection is creosote, which in large well sustained doses, will greatly reduce the suffering from consumption and will conduce to recovery." FLICK: *Therapeutics of Tuberculosis*, p. 15.

CALCREOSE (calcium creosotate) is a mixture containing in loose chemical combination creosote and calcium oxid.

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When you prescribe "Formin"
you choose the brand

When you merely prescribe
"Hexamethylenamine"
someone else chooses for you

Formin costs no more

Merck & Co., New York

(Continued from page 48)

ville, Vice-President; Dr. R. C. Black, Stephenville, Secretary-Treasurer.

Falls County Medical Society has elected Dr. S. S. Munger, Marlin, President; Dr. J. H. Barnett, Marlin, Vice-President; Dr. O. T. Bundy, Marlin, re-elected Secretary-Treasurer.

Hale-Floyd-Briscoe-Swisher County Medical Society has elected Dr. D. P. Jones, Plainview, President; Dr. J. F. Owens, Plainview, Vice-President; Dr. J. F. McClendon, Plainview, Secretary-Treasurer.

Harris County Medical Society has elected Dr. C. C. Cody, President; Dr. R. M. Hargrove, Vice-President; Dr. F. O. Calaway, Secretary-Treasurer.

Hidalgo County Medical Society has elected Dr. R. E. Utley, Mercedes, President; Dr. W. E. Whigham, Donna, Vice-President; Dr. John Hunter, McAllen, re-elected Secretary-Treasurer.

Jones County Medical Society has elected Dr. J. F. Taylor, Hamlin, President; Dr. F. P. Bunkley, Stamford, Vice-President; Dr. A. McK. Jones, Anson, re-elected Secretary.

Kaufman County Medical Society has elected Dr. G. F. Powell, Terrell, President; Dr. H. A. Taylor, Kemp, Vice-President; Dr. W. J. Pollard, Kaufman, re-elected Secretary-Treasurer.

Potter County Medical Society has elected Dr. H. H. Latson, President; Dr. L. E. Petty, Vice-President; Dr. Richard Keys, re-elected Secretary-Treasurer.

Red River County Medical Society has elected Dr. H. R. Smith, Detroit, President; Dr. Claud Scaff, Clarksville, Vice-President; Dr. Alvin Dinwiddie, Clarksville, Secretary-Treasurer.

Tarrant County Medical Society has elected Dr. W. R. Thompson, President; Dr. Arthur Brown, Vice-President; Dr. A. W. Montague, Jr., Secretary-Treasurer.

Van Zandt County Medical Society has elected Dr. W. C. Hearin, Canton, President; Dr. B. B. Brandon, Edgewood, Vice-President; Dr. D. Leon Sanders, Wills Point, re-elected Secretary-Treasurer.

Williamson County Medical Society has elected Dr. Melton R. Sharp, Granger, President; Dr. W. G. Pettus, Secretary.

Wise County Medical Society has elected Dr. J. J. Ingram, President; Dr. R. T. Spencer, Vice-President; Dr. W. L. Russell, re-elected Secretary-Treasurer.

(Continued on page 52)

BORCHERDT'S MALT SOUP-EXTRACT

A STANDARD
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(Free From Alcohol)
For Preparing
MALT SOUP

Of recognized value in the treatment of infants suffering from marasmus, atrophy and malnutrition.

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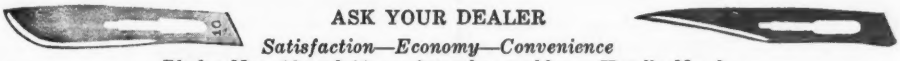
Blade No. 23 interchangeable with Nos. 20, 21 and 22 on Handle No. 4



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The objections to brewers' yeast were that, being wet, it could not be kept for more than a day or two, and its taste was not favored by everyone.

These objections have been overcome entirely by the Brand Laboratories. A process has been developed which makes it possible to dry brewers' yeast so that it will maintain its fermentative power and likewise its full vitamin B content. Brand's Brewers' Yeast is the equal in every way of the wet yeast obtained from the fermenting vats. Brand's Brewers' Yeast is dispensed in capsules only.

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Binder and Abdominal Supporter

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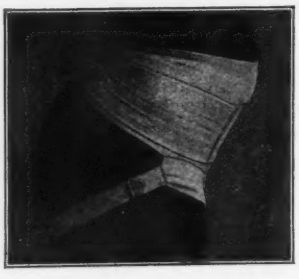

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(Continued from page 50)

The Medical and Surgical Association of the Southwest, composed of Arizona, New Mexico and West Texas, met in El Paso December 7-9. The following officers were elected: Dr. R. D. Kennedy, Globe, Ariz., President; Dr. J. R. Van Atta, Albuquerque, N. M., First Vice-President; Dr. J. R. Gilbert, Alomogordo, N. M., Second Vice-President; Dr. H. R. Carson, Phoenix, Ariz., Secretary-Treasurer.

A new addition, which will be devoted to a children's clinic, is being added to the Richmond Freeman Hospital, Dallas. The building and equipment will cost $60,000.

Three new units, the pay ward, the contagious ward and a ward for general cases, have been recently constructed at the Parkland Hospital, Dallas. The cost was $525,000.

Dr. H. L. Noble has been named a member of the Men's Advisory Committee of the Protestant Orphans' Home, West End, San Antonio, to fill the place made vacant by the death of Col. F. L. Town.

Deaths

Dr. Marion Wassam, Galveston, aged 76, died December 12.

Dr. Sevier E. Snodgrass, West, aged 73, died suddenly January 2 from acute indigestion.

Dr. Ban S. Brown, Kerens, aged 53, died January 13.

Dr. George W. McKown, Osceola, aged 64, was shot and killed January 11.

Dr. Edward Alexander Holland, San Antonio, aged 62, died November 2.

Dr. John Saunders Carter, Dallas, aged 49, died January 7.

Dr. Charles E. Terrell, Fort Worth, aged 59, died December 16 after a long illness.

Dr. Collin B. Brown, Edgewood, aged 68, died December 30 at the Baylor Hospital, Dallas.

Dr. William Vann Rumph, Fort Worth, aged 54, died December 20.

VIRGINIA

The Seaboard Medical Association of Virginia and North Carolina met in New Bern, N. C., in December. The following officers were elected: Dr. Joseph T. Buxton, Newport News, President; Drs. William E. Warren, Williamston, N. C.; Cora Z. Corpening, Suffolk, George A. Caton, New Bern, N. C., and Russell M. Cox, Portsmouth, Vice-Presidents; Dr. Clarence Porter Jones, Newport News, Secretary-Treasurer.

(Continued on page 54)

When your Sphygmomanometer shows your patient has high blood pressure, what are you going to do?

Would you be willing to be convinced that Electro-therapy is of great value to you in many such cases?

We have a very special proposition to make physicians who want to investigate this subject.

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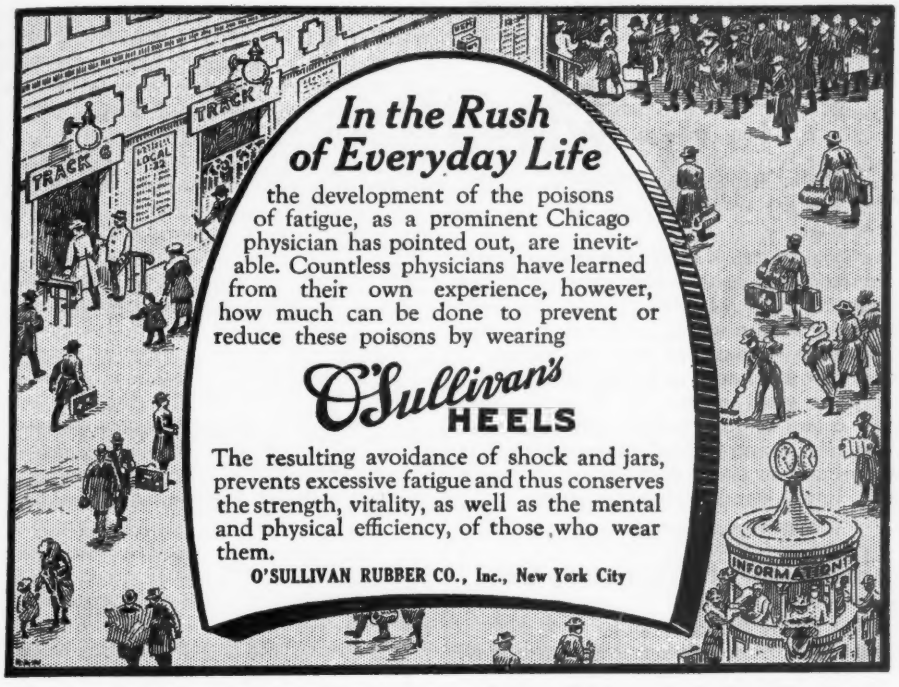

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For Medical Protective Service
Have a Medical Protective Contract.

The Medical Protective Co.

of

Fort Wayne, Indiana.

(Continued from page 52)

Lynchburg and Campbell County Medical Society has elected Dr. F. O. Plunkett, President; Dr. James R. Gorman, Vice-President; Dr. R. D. Caldwell, Secretary-Treasurer.

Richmond Academy of Medicine has elected Dr. J. Allison Hodges, President; Drs. Greer Baughman, C. F. Bright and St. George Grinnan, Vice-Presidents; Dr. Mark Peyser, Secretary; Dr. Howard Urbach, Treasurer.

Southside Virginia Medical Association has elected Dr. W. C. Harman, Dolphin, President; Drs. H. M. M. Snead, South Hill, W. T. Gray, Suffolk, F. J. Wright, Petersburg, T. G. Hardy, Farmville, Vice-Presidents; Dr. R. L. Raiford, Secretary-Treasurer.

Warwick County Medical Society has elected Dr. W. S. Snead, President; Dr. C. B. Courtney, Vice-President; Dr. Samuel Downing, Secretary-Treasurer.

The University of Virginia, in order to meet the need of trained health workers in the State, is offering courses in public health work and sanitary inspection, under the direction of Dr. William S. Keister, Charlottesville. The State Board of Health will cooperate in this work. The courses began January 3.

The Lions Club, Roanoke, is supporting a free bed at Catawba Sanatorium for the care of tubercular patients, the patient to come from Roanoke City or Roanoke County.

Dr. Clifton M. Miller, Richmond, has been elected President of the Kiwanis Club.

Dr. Paul W. Howle, Richmond, has been appointed Physician to the City Jail, succeeding Dr. W. S. Gordon, who resigned because of ill health. Dr. Gordon has held this position for nearly twenty-five years.

Dr. S. W. Budd, Richmond, has been chosen Pathologist at Retreat for the Sick, Richmond, to fill the vacancy caused by the death of Dr. E. G. Hopkins.

Deaths

Dr. Eramus Guy Hopkins, Glen Allen, aged 45, died December 19 from carcinoma.

Dr. Edward Addison Craighill, Lynchburg, aged 82, died January 2 from senility.

Dr. Armistead Green Taylor, Mattoax, aged 81, died January 2 from senility.

Dr. James Merit Melton, Crozet, aged 51, was instantly killed in an automobile accident January 10.

(Continued on page 56)

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Send them to us; you will be pleased. COST IS SMALL compared with price of new instruments.

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Protein indigestion or the failure to take care of the casein of cow's milk may result in delayed bowel movements.

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acts upon the casein of milk in such a manner that the coagulated casein is presented in a most favorable condition for the action of the digestive fluids; therefore, Mellin's Food is especially indicated in constipation due to faulty protein digestion, and results will at once be apparent if Mellin's Food is used in sufficient amount to thoroughly attenuate the milk casein.

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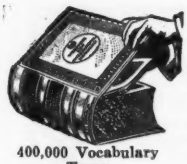

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(Continued from page 54)

Dr. Spotswood Hayes Parker, University, aged 41, died January 8 following a long illness.

Dr. Orion Baum, Vine, aged 64, died January 9.

Dr. Samuel Stewart Snarr, Mt. Jackson, aged 42, died December 12.

Dr. Claude Dalby Kellam, Norfolk, aged 41, died December 15 at the United States Naval Hospital after an illness of several weeks.

Dr. Mary Elizabeth Nutter, Norfolk, aged 71, died October 4 from senility.

Dr. Frank Green Simmons, Richmond, aged 55, died January 26.

WEST VIRGINIA

Cabell County Medical Society has elected Dr. Wilkinson, President; Dr. Andrew J. Sweazey, Vice-President; Dr. Oscar B. Biern, Secretary; Dr. Ray M. Bobbitt, Treasurer.

Eastern Panhandle Medical Society has elected Dr. William Neill, Charles Town, President; Dr. Howard Osborne, Rippon, Vice-President; Dr. M. H. Porterfield, Martinsburg, Secretary-Treasurer.

Fayette County Medical Society has elected Dr. H. C. Skaggs, President; Dr. W. E. Bruce, First Vice-President; Dr. J. W. Hopkins, Second Vice-President; Dr. H. L. Goodman, Secretary-Treasurer, re-elected.

Monongalie County Medical Society has elected Dr. R. H. Edmonson, President; Dr. T. Jud McBee, Vice-President; Dr. Wm. B. Scherr, Secretary; Dr. W. C. Kelly, Treasurer.

A committee of the West Virginia Medical Society appeared before the State Board of Education, Charleston, recently, to urge the inauguration of a four years' medical course at the West Virginia University School of Medicine, Morgantown.

The Guyan Valley Hospital, Logan, will be opened March 15. The institution has a capacity of ninety beds.

Deaths

Dr. Albert H. Kunst, Parkersburg, aged 79, died January 17 from heart disease.

Dr. Prince Cooper, Van, aged 36, died December 7 at the County Hospital from meningitis.

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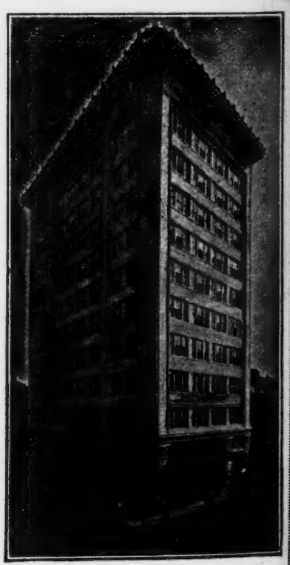

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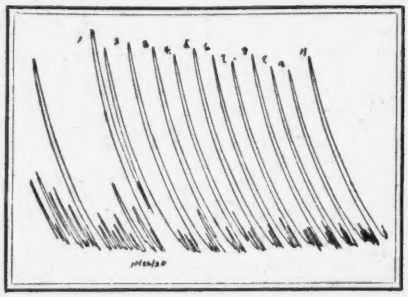
THAT the physician may have at command a reliable pituitary extract, it is essential that it be carefully standardized. The standardization of Pituitrin is based on the fact that solutions containing the active agent act on unstriated muscle, such as that of the uterus and the arteries, to cause typical contractions.

The reaction is directly proportional to the content of active agent and can be measured by the use of appropriate apparatus and animals.



Tracing illustrating a series of tests of Pituitrin by the Oxytocic or Isolated Uterus Method. No. 1 is a maximal contraction. Nos. 9 and 10 are equivalent submaximal reactions of sample and standard respectively.

The action on the uterus, known as the Oxytocic test, is applied to a strip of uterine muscle from a properly selected guinea-pig, the test strip being suspended in warm oxygenated Locke's solution to which the Pituitrin is added. The muscle contracts more or less in proportion to the amount of active agent present and by means of a lever records the degree of activity on a revolving drum.

The action on the arteries is determined indirectly by the rise in blood pressure following intravenous administration and is known as the Pressor test. It is carried out on anesthetized dogs. The effect on the blood pressure is recorded directly from the carotid artery. This is the more accurate and in some respects the more difficult test of the two.

In the performance of these tests special skill and experience are required to avoid errors that would vitiate the results. In the Oxytocic test, for example, uteri from several animals may have to be tried before one suitable for the purpose is found. Excessive irritability due to congestion and inflammation of the musculature renders the specimen unfit for use. Likewise to be rejected are those muscle strips that fail to register equal contractions from like doses of a standard extract. And in every case both standard and test samples of Pituitrin must be sufficiently dilute to obviate the occurence of the maximum contraction of which the muscle strip is capable, since such an effect would leave the operator in doubt as to the exact degree of activity of the specimen under test.

From these facts it may be appreciated that many difficulties are encountered in the physiologic standardization of pituitary extracts. It is therefore not surprising that there is such a lack of uniformity in the activity of commercial preparations.

Owing to the fact that all pituitary preparations in liquid form deteriorate with age, and in order that the standardization of Pituitrin may be of greatest value to the physician, a date is placed on each package after which the contents should not be used unless due allowance is made for a probable loss of activity.

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